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FORTY-FOURTH AND FORTY-FIFTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF MICHIGAN

FOR THE

FISCAL YEARS ENDING JUNE 30, 1916, AND JUNE 30, 1917.

BY AUTHORITY

LANSING, MICHIGAN
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LETTER OF TRANSMITTAL.

Office of
Secretary of the State Board of Health,
Lansing, Michigan, July 1, 1917.

To the Honorable Albert E. Sleeper, Governor of Michigan:

Sir:—In compliance with Section 5 of Act 81, P. A. 1873, as amended by Act 18, P. A. 1905, being section 4992 Compiled Laws of 1915, of the laws governing this Board, I have the honor to herewith submit the annual report for the fiscal years ending June 30, 1916, and June 30, 1917.

Very respectfully,
R. M. OLIN,
Secretary and Executive Officer, State Board of Health.

MEMBERS

OF THE

MICHIGAN STATE BOARD OF HEALTH.

	Term Expires.
Victor C. Vaughan, Ph. D., M. D., *President.* Ann Arbor	January 31, 1919.
Edward T. Abrams, M. D., *Vice-President,* Hancock	January 31, 1921.
Richard M. Olin, M. D., *Secretary and Executive Officer,* Lansing	March 29, 1923.
William F. English, M. D., Saginaw	January 31, 1923.
Andrew P. Biddle, M. D., Detroit	January 31, 1919.
Guy L. Kiefer, M. D., Detroit	January 31, 1923.
William D. Farley, L. E., Battle Creek	January 31, 1921.

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PART I.

REPORT OF THE SECRETARY FOR THE FISCAL YEARS JULY 1, 1915, TO JUNE 30, 1917.

EXTRACTS OF MINUTES OF BOARD MEETINGS.

REGULAR MEETING, LANSING, JULY 10, 1915.

Members present: Drs. Abrams, Bartholomew, Biddle, Kellogg, Mr. Farley and the Secretary.

Governor Ferris entered the meeting by appointment at 11 o'clock. After greeting the members of the Board, he advised them that he was making a personal visit to all the boards investigating their expenditures with an effort of determining whether strict economy was being exercised in every state department. He complimented this Board upon the work that had been done in the past and stated that he expected they would do as well in the future, particularly since the Legislature had so generously given them $100,000 for the prosecution of their campaign against tuberculosis. After giving several suggestions and commenting upon the very kindly feeling that evidently existed between the chief executive and the various boards of health, the Governor withdrew at 12:30 and the Board took a rest until 1:30 o'clock.

The Board reconvened at 2 o'clock. Members present: Drs. Abrams, Kellogg, Biddle, Bartholomew, Mr. Farley and the Secretary.

On motion Drs. Abrams, Bartholomew and Biddle were appointed to constitute a special committee to secure a competent bacteriologist for the upper peninsula laboratory.

The quarterly report of the State Sanitary Engineer was accepted as read and the recommendations contained therein relative to citing the city officials of Menominee before this board were adopted, and the Secretary was requested to notify the city officials of Menominee accordingly.

ADJOURNED MEETING, LANSING, AUGUST 13, 1915.

Members present: Drs. Vaughan, Abrams, Kellogg, Bartholomew, Biddle, Mr. Farley and the Secretary.

The Secretary presented to the Board a proposed revision of the rules and regulations relative to dangerous communicable diseases. The president instructed that the matter should be referred to the committee on rules and regulations in relation to control of dangerous communicable diseases.

The report from the committee appointed to secure a bacteriologist for the upper peninsula laboratory was in order. Upon the suggestion of Dr. Abrams that the committee should have further time to consider the matter, the request was granted.

The Board took up the consideration of the plan for the anti-tuberculosis campaign work and upon the subject, the President advised the board that he believed a man should be appointed to take charge of the work, that the Board should establish a tuberculosis division of the department of the State Board of Health, just as it has an engineering division, with a man at the head, this man to be responsible for the work. The President recommended Dr. William De Kleine for the position at a salary of $250.00 per month, with instructions to begin work August 16, 1915. On motion, the following resolution was adopted: That the tuberculosis committee be asked to begin active work at once and be authorized to employ such physicians, nurses and other agents, and to take such other action as is necessary for the vigorous prosecution of the work.

On motion of Dr. Abrams, supported by Dr. Biddle, Dr. M. L. Holm was employed as bacteriologist for the upper peninsula laboratory, at a salary of $2,200.00 per year.

ADJOURNED MEETING, GRAND RAPIDS, SEPT. 22, 1915.

All members present.

The committee on tuberculosis campaign reported that at a meeting of the committee held at Ann Arbor, August 16, 1915, Miss Dean of Detroit, was selected to act as chief nurse under the provision of Act 238, P. A. 1915, but refused to accept and the committee had considered the applications of Miss Mary Connaughton and Miss Ada M. Coleman and recommended that they be employed by the board to act as assistant superintendent nurses, at a salary of $125.00 per month and necessary traveling expenses when on duty, and that Miss Gladys Voorhees be employed as stenographer in this division at a salary of $75.00 per month.

Dr. Abrams, chairman of the committee for Houghton laboratory, reported that Dr. Holm had reported for duty and was now engaged in preparing a list of necessary equipment and arranging the laboratory; that it became necessary to employ a stenographer and he had therefore secured Miss Effie M. Elliott of Houghton for the work on August 30, 1915, at a salary of $800.00 per year.

Drs. Bartholomew and Biddle were appointed a committee to investigate the practicability of doing Wassermann and other tests necessary in the laboratory in diagnosis of venereal diseases.

REGULAR MEETING, DETROIT, OCT. 8, 1915.

There being no quorum present, the meeting was adjourned until Monday, Oct. 11, at the Hotel Tuller, Detroit.

MONDAY, OCT. 11, 1915.

Members present: Drs. Abrams, Kellogg, Biddle, Bartholomew, and the Secretary.

The committee on the upper peninsula laboratory reported that Dr. M. L. Holm, bacteriologist at Houghton laboratory, had filed his resignation with the chairman of the committee to take effect Sept. 30, 1915. On motion of Dr. Biddle, supported by Dr. Bartholomew, the resignation was accepted to take effect immediately. Mr. E. R. Chambers, assistant bacteriologist of this Board, of the Lansing laboratory, was assigned to temporary duty as bacteriologist of the Houghton laboratory, at a salary of $2,200.00 per year.

The Secretary reported that the exhibit of the State Board of Health had been sent to the following places during the past quarter: Marquette County Fair, one week; Grand Rapids Fair, ten days; and in addition to this a successful Good Health Week was conducted at Alma, Michigan, October 3-8. The Secretary reported that several additions to the exhibit had been made, particularly child welfare, tuberculosis, and unclean milk; some new moving picture films illustrating these subjects were now available and were being used in Good Health Weeks and public lectures.

The Secretary reported that with the consent of the district medical inspectors, some divisions of territory had been made, for the purpose of decreasing the traveling expenses which have been the subject of some criticism by the Board of State Auditors, and the following changes were recommended: That the second district be divided and that Jackson and Lenawee Counties be assigned to Dr. Parnall of Jackson; that Ionia County in the eighth district be assigned to Dr. F. A. Johnson of Greenville; that Keweenaw County in the twelfth district be assigned Dr. McDonald, and Ontonagon County be assigned to Dr. Evans of Greenland.

The committee appointed to report upon the advisability of beginning the Wassermann test in the laboratories of this Board reported that in their estimation, the time had arrived to institute this very necessary work.

SPECIAL MEETING, HOTEL STATLER, DETROIT, DEC. 20, 1915.

Members present: Drs. Vaughan, Kellogg, Biddle, Bartholomew and the Secretary.

This meeting was called for the purpose of a hearing upon the Monroe water question. The meeting was also attended by city officials from the city of Monroe. After considerable discussion relating to this question, the representatives of Monroe city withdrew and the Board went into executive session.

The Secretary read a resolution passed by the Penology Commission regarding examination of inmates of State institutions to determine the existence of tuberculosis and syphilis, and asking the asistance of the State Board of Health. On motion of Dr. Bartholomew, supported by Dr. Biddle, the State Board of Health agreed to do this work if the State Board of Corrections and Charities would pay the expense.

The Secretary read a communication from the upper peninsula, protesting against the establishment of the branch laboratory at Houghton. Dr. Vaughan advised that the matter had better be taken up when Dr. Abrams was present.

SPECIAL MEETING, HOTEL STATLER, DETROIT, MARCH 10, 1916.

Members present: Drs. Vaughan, Kellogg, Biddle, Bartholomew, Mr. Farley and the Secretary. There were also present at this meeting E. D. Rich, Sanitary Engineer of this Board, and Acting Medical Inspectors Bingham and Waterman, also Village President F. J. Hoffman, Councilman C. P. Parsons, and Mr. Wm. B. Schad, a business man representing the village of Royal Oak.

This meeting was called in accordance with a resolution passed at the meeting held in Lansing, January 21, "That the mayor and common council of the village of Royal Oak, Michigan, be required to appear before the State Board of Health and show cause why they should not construct a proper sanitary sewer system and sewage disposal tanks." After discussion of the topography and conditions relative to bonding, also a recommendation by Mr. Rich that immediate steps toward the construction of a sewer system be taken, the following motion was made by Dr. Kellogg, supported by Dr. Bartholomew,—That the village of Royal Oak be asked to take immediate steps to provide a proper sewer system for that village and that they be advised to employ a competent engineer to prepare plans and that the plans be submitted to the State Board of Health; that Mr. Rich be asked to visit the community and advise with the council and with the people of the village so that they may act intelligently.

REGULAR MEETING, LANSING, APRIL 14, 1916.

The Secretary reported upon the contagious disease situation in Michigan, especially upon scarlet fever in the city and county of Muskegon. The illness and death of Mr. D. E. McClure, assistant secretary, the progress of the tuberculosis campaign, and other matters pertaining to the general work of the board were stated to the Board by the Secretary. The secretary presented the names of the new employes of the tuberculosis survey force: Nurses, Margaret Wellwood, Minnie Rayburn, Rose McLaughlin, Susan K. Desk, Lucy M. Bushey, Elizabeth Cannon, Minna P. Schonert; Dr. E. R. Vander Slice, medical expert; Robert E. Todd, housing expert; Charles P. Wagner, organizing expert; R. A. Shankweiler, medical expert.

Election of officers for the Board for the ensuing year resulted as follows: President, Dr. Vaughan; Vice-President, Dr. Abrams.

REGULAR MEETING, LANSING, JULY 14, 1916.

Members present: Drs. Biddle, Kellogg, Bartholomew, Mr. Farley and the Secretary.

The Secretary read the monthly, quarterly and annual financial reports for the fiscal year ending June 30, 1916, which was accepted, placed on file and ordered printed in the July issue of Public Health. The Secretary presented the quarterly report of the Sanitary Engineer, which was accepted, placed on file and the recommendations adopted.

Upon motion of Dr. Kellogg, supported by Dr. Bartholomew, the following recommendation of the tuberculosis survey committee was read: That the Secretary be instructed to authorize the purchase with such funds as can be spared after all other necessary expenses have been provided for from the appropriation for the present fiscal year, such apparatus and material as may be needed for special purposes in carrying out the tuberculosis survey.

The Secretary reported that the laboratory in Lansing was equipped with new apparatus and prepared to do the Wassermann tests, and because of the increase of the general laboratory work, recommended that the salary of the bacteriologist of the Lansing laboratory be increased $2,500 per annum. Increase to be effective July 15, 1916.

On motion of Dr. Biddle, the Secretary was instructed to send out a letter to each Health Officer in the State, especially in summer resorts, warning the public against persons coming from localities where infantile paralysis exists.

Dr. Biddle suggested that in view of the fact that this Board had never seen the laboratory in the upper peninsula, it might be wise to hold a meeting there, and upon motion this meeting adjourned to meet in the laboratory in the College of Mines Building at Houghton, Wednesday, August 16, 1916.

SPECIAL MEETING, COLLEGE OF MINES BUILDING, HOUGHTON, AUGUST 16, 1916.

Members present: Drs. Vaughan, Kellogg, Abrams, Biddle, Bartholomew and Mr. Farley.

The Board inspected the upper peninsula laboratory and was much pleased with the location, convenient arrangements and efficient equipment. In the afternoon the board listened to several doctors on the subject of moving the upper peninsula laboratory from Houghton to Marquette. After the gentlemen had expressed their opinion and suggestions, they withdrew from the meeting and the board gave its attention to the tuberculosis survey.

REGULAR MEETING, LANSING, OCTOBER 13, 1916.

Members present: Drs. Vaughan, Abrams, Bartholomew, Biddle and Kellogg.

The quarterly report of the State Sanitary Engineer was read, and upon motion was accepted and the recommendations contained therein approved.

The Board spent much time in discussing the subject of the housing expert employed by this Board to make a survey of the State, and the Board finally advised Dr. Burkart that the matter was entirely in his hands, and he would be expected to furnish the necessary report, and if necessary, Mr. Todd was to be re-employed for that purpose.

POSTPONED MEETING AT DETROIT, HOTEL TULLER, DETROIT, NOVEMBER 10, 1916.

All members present.

Mr. Arnold Mulder at the request of Dr. De Kleine read the tentative report of the tuberculosis survey covering the period from October 1, 1915, to October 1, 1916, which had been ordered prepared at the last regular meeting of the board.

Dr. Vaughan recited the work of the State Board of Health relative to tuberculosis and stated that in his opinion it was declared a dangerous disease in 1895.

On motion Dr. V. C. Vaughan, Jr., was employed by the Board to prepare a medical report of the work done in the tuberculosis survey from October 1, 1915, to October 1, 1916, and his compensation fixed at $15 per day.

SPECIAL MEETING, HOTEL TULLER, DETROIT, DECEMBER 29, 1916.

Members present: Drs. Vaughan, Biddle, Bartholomew, Burkart and Mr. Farley.

The Secretary presented the outline of a plan to authorize the formation of health districts composed of contiguous townships and villages, which was to be presented to the Legislature by Hon. Samuel T. Douglas of Detroit.

The Secretary read a summary of what amendments to the present health laws were necessary, and reported that the Attorney General's office had been consulted and would render every assistance in indicating what legal phraseology was necessary.

REGULAR MEETING, LANSING, JANUARY 12, 1917.

Members present: Drs. Vaughan, Abrams, Burkhart, Kellogg, Biddle and Mr. Farley.

The Secretary read the report of the State Sanitary Engineer, which was accepted and the recommendations contained therein were adopted.

The Secretary read a communication from Dr. Hugo Ericksen, Secretary of the Michigan Cremation Association of Detroit, under date of January 9, 1917, submitting a proposed bill to provide for the registration of cremations in Michigan, which he desired the approval of the State Board of Health upon. Upon motion, the above bill was approved by the Board.

The Secretary read a communication from Jenks & Muir Company of Detroit under date of January 5, 1917, submitting a proposed bill to provide for the branding and labeling of mattresses and comforts, and to provide against the use of unsanitary, unhealthy, old or second-hand material in the manufacture of the same. Upon motion of the board, the above bill was approved.

The Secretary read the completed copies of the proposed bills to be submitted to the Legislature, and upon motion, a legislative committee consisting of the President, Dr. Bartholomew, and the Secretary was appointed to review the proposed measures and decide upon the advisability of submitting any or all to the Legislature.

A resolution was adopted authorizing the Secretary to request Senator Murtha to present a bill to the Legislature of 1917, asking a continuance for two years more of the appropriation granted by Act 238 of the Public Acts of 1915.

SPECIAL MEETING, LANSING, MARCH 16, 1917.

Members present: Drs. Vaughan, Abrams, Biddle, Burkart and Mr. Farley.

The Secretary then introduced the newly appointed members of the Board, Drs. Guy L. Kiefer of Detroit, and William F. English of Saginaw, as having been appointed by the Governor, confirmed by the Senate, and qualified under the State law as members of the Michigan Board of Health and eligible to voice and vote thereon.

The following resolution was presented by Dr. Abrams and supported by Mr. Farley, and adopted: In view of the fact that Dr. Burkart is not a candidate for reappointment as Secretary of the State Board of

Health, and as certain members of the Board favor the appointment of Dr. De Kleine, while other members favor the appointment of Dr. R. M. Olin, be it resolved that the Governor be informed that the appointment of either of these men will be satisfactory to the Board, and that we do hereby recommend to him the appointment of either.

REGULAR MEETING, LANSING, APRIL 13, 1917.

Members present: Drs. Biddle, Kiefer, English, Mr. Farley, and the new Secretary, Dr. R. M. Olin.

The Secretary presented a communication from the State Sanitary Engineer recommending the supervision by sanitary inspectors of the janitor work in railroad trains and stations.

The secretary was instructed to write to the Health Officers throughout the State for reports upon the condition of the railroad stations in their respective towns. Then to write the railroad companies relative to the complaints made of conditions in their districts.

The Secretary asked the Board to state what method of vaccination against smallpox it recognized. Dr. Kiefer advised the Secretary that he believed that vaccination would mean to the State Board of Health innoculation upon the arm or leg with bovine virus. The Board concurred in this definition.

The following action upon relation of State Board of Health employees to the Board was taken: Resolved that all employees of the Michigan State Board of Health be responsible to the Board through the Secretary, and that all heads of departments make reports regularly in writing to the Secretary. Such report to state in detail the work done, and the amount of money expended, and to be expended with the various departments.

The status of the water examinations for the railroads was discussed fully, and it was decided that the Secretary's suggestion should be carried out, which suggestion was that he should communicate with different railroads throughout the State to the effect that inasmuch as the U. S. Public Health service in the future required a survey to be made at the time the samples were secured, if they would furnish transportation for our inspectors, the department would send a man to make the necessary surveys and secure the samples in compliance with the rules of the U. S. Health Service. But if this seemed unwise or impracticable, this department would discontinue work.

The matter of the bacteriological department doing the Wassermann for $2.50 was thoroughly discussed and the following plan was decided upon: In the future, for a time at least, this department would make these tests free of charge, provided the physicians sending in the specimens would send the patient's name and address at the time the sample was sent, with the understanding that the Secretary of the Board would notify the patient that an examination of the blood had been made, for which the state makes no charge, and that the result of the examination could be ascertained from the physician sending in the sample.

EXAMINATION AND LICENSING OF EMBALMERS.

Under the provisions of Act No. 132, Laws of 1903, four examinations were held during the two years ending June 30, 1917, as follows:

Detroit, July 27, 28 and 29, 1915. Escanaba, August 4 and 5, 1915. Lansing, November 16, 17 and 18, 1915. Lansing, June 27, 28 and 29, 1916. Lansing, November 21, 22 and 23, 1916. Lansing, May 22, 23 and 24, 1917.

Of the 138 persons examined, 91 were granted licenses.

Reciprocal licenses were granted in 10 instances.

A statement of expenses incurred in the operation of Act 132 may be found on a subsequent page of this report.

The following letter, issued in June, 1915, will serve to show the scope of the embalmers' examination, and the conditions to be complied with on the part of the applicants for examination:

STATE BOARD OF HEALTH.

OFFICE OF THE SECRETARY, LANSING.

To the Funeral Directors and Embalmers.

GENTLEMEN:

You are hereby informed that a meeting of the State Board of Health, called for the purpose of conducting an Embalmers' Examination, will be held in the city of Detroit, July 27, 28 and 29th, 1915, in the Detroit College of Medicine Building. The examination will commence at 9 o'clock, Tuesday morning, July 27th.

Candidates will be required to take both *written* and *oral* examinations with demonstration on the cadaver. Oral examinations will be given in the order applications are received. Some of the general subjects included in the written examination are:

(a) Visceral anatomy and the circulation of the human body, both arterial and venous.

(b) The nature, action, modes of action and comparative value of disinfectants.

(c) The methods of embalming and preparing bodies for transportation, also shipping rules.

(d) How diseases are spread, the best method for the restriction of diseases, and bacteriology in relation to the spread of diseases.

(e) The signs of death and the manner in which it is determined.

Those who desire to take the examination at this time, must fill out and return to the Secretary of the Board, the enclosed application blank, with an unmounted photograph of the applicant, signed in ink on the back and properly certified to by a notary. A fee of five dollars must accompany the application. Remittances may be made by express or postoffice money order or by registered letter. *Personal checks cannot be used.*

Applications should be on file in this office *thirty days* before the date of examination.

Application must be made in the name of an individual, and not of a firm.

Applicant's name must be signed in full.

In the examination, a rating of at least seventy-five per cent must be made by the applicant to secure a license.

By direction of the State Board of Health.

JNO. L. BURKART,
Secretary.

GENERAL AND SPECIAL WORK IN THE OFFICE OF THE SECRETARY.

Much of the general work of the office naturally groups itself under three heads: the collection of information, the compilation of information so collected, and the dissemination of such information as will be of service in the restriction and prevention of disease.

COLLECTION OF INFORMATION.

As the local health officer is the principal medium by which this Board may reach and instruct the public in matters pertaining to the prevention of sickness and deaths, the appointment, and the return of the names and postoffice addresses of the health officers, in each year, are matters of more than ordinary interest and importance.

In each year, it is often necessary to make a first, second and third request for information which will place this office in communication with the local health officers, and during the time which is thus used up in corresponding and waiting, an outbreak of a dangerous disease may begin and become widespread before this office can afford the usual assistance to the proper officials in the locality.

It should be said, however, that there is an increasing tendency to comply with the law in this particular, and local boards of health now generally act promptly and co-operate cordially with this Board for the suppression of disease.

Having established communication with the newly appointed local health officers, pamphlets and other publications which may aid them in their work, together with the usual blanks for reports of outbreaks of diseases in their locality, are mailed from this Board. In some instances, considerable correspondence is necessary to instruct the health officials how to properly care for sick and infected persons, and to make reports which will be of value in the compilations for the annual reports and other publications of this Board.

In addition to the collection of the usual information relative to outbreaks of dangerous communicable diseases in this State, special information upon subjects of public interest and importance, is sometimes asked for and is usually cheerfully furnished by a large number of health officers and other persons from whom the information is sought.

DISSEMINATION OF INFORMATION.

As stated in the preceding paragraph, each newly appointed health officer is supplied, by this office, with information relative to his duties. This information is contained principally in a pamphlet entitled "Health Officers' Manual," and in pamphlets covering the principal points in the etiology and methods of restriction and prevention of each of the dangerous communicable diseases.

Upon the receipt of information relative to an outbreak of a dangerous communicable disease, in addition to the usual instructions and blanks for making the reports, there are mailed to the health officers a sufficient number of pamphlets, relative to the particular disease then present, for distribution to the families and immediate neighbors of the sick person. In this way the people are educated as to their duty, under the law, and their co-operation with the local health officers often secured.

A pamphlet covering the law respecting nuisances, and containing information relative to their suppression, is published, and distributed among those persons directly interested, when a complaint of a nuisance is made to this office.

A pamphlet, giving the law and regulations of this Board, respecting the preparation and shipment of dead bodies, is published, and distributed among the licensed embalmers, railroad officials, and other persons interested in the transportation of the dead.

ANNUAL REPORTS.

About 1,500 copies of the annual report are published each year and are distributed among the following:

Members and ex-members of the State Board of Health; secretaries of state, territorial and provincial boards of health; sanitary journal exchanges; library exchanges.

PUBLIC HEALTH BULLETINS.

Beginning with the fiscal year, July 1, 1913, the quarterly bulletins issued by this Board were discontinued, and a monthly publication, greatly enlarged, covering various topics, directly and indirectly, pertaining to all public health questions intended for the general public, is now being issued instead. Copies of this publication, *Public Health*, may be obtained upon request.

INVESTIGATIONS MADE BY THE STATE MEDICAL INSPECTORS.

FROM JULY 1, 1915, TO JULY 1, 1916.

Forest City, July 1, 1915. Investigation by Dr. H. S. Bartholomew.

Beaver Township, Newaygo County, August 5, 1915. Investigation of tuberculosis by Dr. G. S. Williams.

Cascade Township, Kent County, July 21, 1915. Investigation of smallpox by Dr. C. C. Slemons.

Flint Township, Genesee County, July 23, 1915. Investigation of typhoid by Dr. Don D. Knapp.

Fenton Township, Genesee County, July 12, 1915. Investigation of sanitary conditions at Long Lake summer resort by Dr. Don D. Knapp.

Fenton Township, Genesee County, July 22, 1915. Investigation garbage collection at Long Lake and conditions at Case's Island by Dr. Don D. Knapp.

Fenton Township, Genesee County, July 14-19, 1915. Investigation of sanitary conditions at Long Lake by A. S. Gladden.

Fenton Township, Genesee County, July 27, 1915. Investigation of sanitary conditions at Long Lake and to get garbage system in operation by A. S. Gladden.

St. Ignace, September 11, 1915. Investigation by Dr. F. M. Harkin.

Benton Harbor and St. Joseph, Mich., July 29 and August 5, 1915. Investigation diseased meat case by Dr. C. N. Sowers.

Romeo, August 9 and 14, 1915. Investigation of smallpox by Dr. A. P. Biddle.

Almont, August 21, 1915. Investigation varioloid by Dr. A. P. Biddle.

Watertown Township, Clinton County, September 17, 1915. Investigation of scalp infection by Dr. H. S. Bartholomew.

Greenville, September 10, 1915. Investigation of infantile paralysis by Dr. F. A. Johnson.

Decker, September 9, 1915. Investigation of diphtheria by Dr. W. H. Smith.

Walker Township, Kent County, October 4, 1915. Investigation of tuberculosis by Dr. C. C. Slemons.

De Witt Township, Clinton County, October 3, 1915. Investigation of scarlet fever by Dr. H. S. Bartholomew.

Hampton, Williams and Monitor Townships, Bay County, September 8, 9, and 10, 1915. Investigation whooping cough by Dr. Edward Goodwin.

Bangor Township, Bay County, September 24, 1915. Investigation of nuisance condition at School No. 2 by Dr. Edward Goodwin.

Portsmouth Township, Bay County, October 9 and 10, 1915. Investigation of infantile paralysis by Dr. Edward Goodwin.

Cheboygan, October 30, 1915. Investigation of scarlet fever by Dr. C. M. Williams.

Cheboygan, November 3, 1915. Investigation by Dr. C. M. Williams.

Walker Township, Kent County, October 22, 1915. Investigation of smallpox by Dr. C. C. Slemons.

Alpine Township, Kent County, October 23, 1915. Investigation of smallpox by Dr. C. C. Slemons.

Alpine and Plainfield Townships, Kent County, October 24, 1915. Investigation of smallpox by Dr. C. C. Slemons.

Alpine Township, Kent County, October 25, 1915. Investigation of smallpox by Dr. C. C. Slemons.

Plainfield Township, Kent County, October 26 and 27, 1915. Investigation of smallpox by Dr. C. C. Slemons.

Aurelius Center, November 1 and 2, 1915. Investigation of infantile paralysis by Dr. H. S. Bartholomew.

Lakeview, November 10, 1915. Investigation of smallpox by Dr. F. A. Johnson.

Cadillac, November 8 and 9, 1915. Investigation of diphtheria by Dr. C. C. Slemons.

Alpine Township, Kent County, November 14, 1915. Investigation of smallpox by Dr. C. C. Slemons.

Gull Lake, November 18, 1915. Investigation of sanitary conditions by Dr. A. H. Rockwell.

Monroe, July 24, 1915. Investigation of typhoid fever by Dr. G. L. Kiefer.

St. Clair Heights, October 14, 1915. Investigation of smallpox by Dr. G. L. Kiefer.

Montrose, October 27, 1915. Investigation by Dr. C. D. Chapell.

Brant Township, Saginaw County, October 30, 1915. Investigation relative to breaking quarantine by Dr. C. D. Chapell.

Charlotte, December 14, 1915. Investigation of skin disease by Dr. H. S. Bartholomew.

Caro, November 8, 1915. Investigation of diphtheria by Dr. Edward Goodwin.

Cadillac, November 19-24, 1915. Investigation of diphtheria by Dr. Edward Goodwin.

Summit and Riverton Townships, Mason County, November 22, 1915. Investigation of smallpox by Dr. G. O. Switzer.

Sherman Township, Mason County, November 23, 1915. Investigation of smallpox by Dr. G. O. Switzer.

Blackman and Leoni Townships, Jackson County, October 12 and 13, 1915. Investigation of diphtheria by Dr. C. G. Parnall.

Spring Arbor Township, Jackson County, October 29 and November 3, 1915. Investigation of diphtheria by Dr. C. G. Parnall.

Mesick, October 27, 1915. Investigation of diphtheria by Dr. J. M. Wilhelm.

Pittsford, October 24, 1915. Investigation by Dr. W. H. Sawyer.

Wheatfield Township, Hillsdale County, December 11, 1915. Investigation of diphtheria by Dr. W. H. Sawyer.

Homer, January 20, 1916. Investigation of smallpox by Dr. C. G. Parnall.

Albion, January 12, 1916. Investigation of smallpox by Dr. A. H. Rockwell.

Walker Township, Kent County, December 27, 1915. Investigation of smallpox by Dr. C. C. Slemons.

Walker Township, Kent County, January 5, 1916. Investigation of smallpox by Dr. C. C. Slemons.

Custer, December 25, 1915. Investigation of skin disease by Dr. G. O. Switzer.

Milan, February 2, 1916. Investigation by Dr. John Wessinger.

Stanton, January 3, 1916. Investigation of smallpox by Dr. F. A. Johnson.

Sheridan, January 26, 1916. Investigation of smallpox by Dr. F. A. Johnson.

Linwood, January 5, 1916. Investigation of smallpox by Dr. Edward Goodwin.

McBain, January 13 and 14, 1916. Investigation of scarlet fever by Dr. Edward Goodwin.

Mt. Pleasant, January 22 and 23, 1916. Investigation of diphtheria by Dr. Edward Goodwin.

Albion, February 15, 1916. Investigation of smallpox by Dr. H. S. Bartholomew.

Muskegon, February 15, 21 and 22, 1916. Investigation of scarlet fever by Dr. C. C. Slemons.

Gladstone, February 17 and 18, 1916. Investigation of smallpox by Dr. E. V. McComb.

Shelby, February 10, 1916. Investigation by Dr. G. S. Williams.

Grand Rapids Township, Kent County, March 17 and 18, 1916. Investigation of smallpox by Dr. C. C. Slemons.

Walker Township, Kent County, March 14, 1916. Investigation of smallpox by Dr. C. C. Slemons.

Eloise, March 13, 1916. Investigation of smallpox by Dr. A. P. Biddle.

Ford, March 15, 1916. Investigation of typhoid fever by Dr. A. P. Biddle.

Eloise, March 27, 1916. Investigation of smallpox by Dr. A. P. Biddle.

Lennon, March 11, 1916. Investigation of smallpox by Dr. Don D. Knapp.

Olivet, March 16, 1916. Investigation of smallpox by Dr. A. H. Rockwell.

Martin Township, Mecosta County, March 28, 1916. Investigation of smallpox by Dr. Gordon McAllister.

Big Rapids Township, Mecosta County, April 2, 1916. Investigation of smallpox by Dr. Gordon McAllister.

Detroit, March 30, 1916. Investigation sanitary conditions especially in regard to the existence of tuberculosis by Dr. A. P. Biddle.

Alma, April 4, 1916. Investigation of smallpox by Dr. H. S. Bartholomew.

St. Johns, March 25, 1916. Investigation of scarlet fever by Dr. H. S. Bartholomew.

Maple Rapids, April 13, 1916. Investigation of smallpox by Dr. H. S. Bartholomew.

Napoleon, April 18, 1916. Investigation of scarlet fever by Dr. C. G. Parnall.

Alanson, April 19 and 20, 1916. Investigation of scarlet fever by Dr. Wm. M. Boylan.

Sutton's Bay, April 4, 1916. Investigation of scarlet fever by Dr. J. M. Wilhelm.

Jasper, May 5, 1916. Investigation of smallpox by Dr. C. G. Parnall.

Linwood, February 26, 1916. Investigation of smallpox by Dr. Edward Goodwin.

Adrian, May 19, 1916. Investigation of chickenpox by Dr. C. G. Parnall.

East Lansing, April 26, 27, 29, 30, and May 2 and 5, 1916. Investigation of scarlet fever by Dr. H. S. Bartholomew.

Holton, March 3, 1916. Investigation by Dr. G. S. Williams.

Muskegon Heights, March 4, 1916. Investigation of scarlet fever by Dr. G. D. Williams.

Muskegon Township, Muskegon County, March 5, 1916. Investigation of scarlet fever by Dr. G. S. Williams.

Muskegon Heights, March 6, 1916. Investigation of milk route stables by Dr. G. S. Williams.

Laketon Township, Muskegon County, March 7, 1916. Inspection of schools by Dr. G. S. Williams.

Muskegon Township, Muskegon County, March 8, 1916. Investigation of scarlet fever by Dr. G. S. Williams.

Fruitland Township, Muskegon County, March 10, 1916. Inspection of schools by Dr. G. S. Williams.

Shelby, March 13, 1916. Inspection of schools and investigation by Dr. G. S. Williams.

Mears and New Era, March 14, 1916. Inspection of schools by Dr. G. S. Williams.

Whitehall and Montague, March 16, 1916. Inspection of schools by Dr. G. S. Williams.

Norton Township, Muskegon County, March 21, 1916. Inspection of schools by Dr. G. S. Williams.

Fruitport Township, Muskegon County, March 29, 1916. Inspection of schools by Dr. G. S. Williams.

Fruitland Township, Muskegon County, April 2, 1916. Investigation of quarantine complaint by Dr. G. S. Williams.

Laketon Township, Muskegon County, April 25, 1916. Investigation of scarlet fever and inspection of schools by Dr. G. S. Williams.

Sparta, May 17, 1916. Investigation of smallpox by Dr. C. C. Slemons.

Byron, June 2, 1916. Investigation of scarlet fever by Dr. H. S. Bartholomew.

Hastings, June 19, 1916. Investigation of smallpox by Dr. C. C. Slemons.

INVESTIGATIONS MADE BY THE STATE MEDICAL INSPECTORS.

FROM JULY 1, 1916, TO JULY 1, 1917.

Hudson, July 8, 1916. Investigation of smallpox by Dr. H. S. Bartholomew.

Walkerville, June 28, 1916. Investigation of smallpox by Dr. G. O. Switzer.

Langston, May 31, 1916. Investigation of scarlet fever by Dr. F. A. Johnson.

Ionia, July 17, 1916. Investigation of anterior poliomyelitis by Dr. F. A. Johnson.

East Jordan, July 6, 1916. Investigation of scarlet fever by Dr. W. M. Boylan.

Clinton, June 8, 1916. Investigation of diphtheria by Dr. C. G. Parnall.

Clinton, July 18, 1916. Investigation of smallpox by Dr. C. G. Parnall.

Hudson, July 7, 1916. Investigation of smallpox by Dr. C. G. Parnall.

Rogers City, July 27, 1916. Investigation of smallpox by Dr. C. M. Williams.

Covington, July 6, 1916. Investigation of epidemic by Dr. H. A. Sharpe.

Kalamzoo, July 10, 1916. Investigation of poliomyelitis by Dr. A. H. Rockwell.

Colon, July 20, 1916. Investigation of smallpox by Dr. A. H. Rockwell.

Bridgeport, June 24, 1916. Investigation of communicable disease by Dr. Don D. Knapp.

Pontiac, July 28, 1916. Investigation of infantile paralysis by Dr. Don D. Knapp.

Howard City, August 12, 1916. Investigation of infantile paralysis by Dr. Clyde F. Karshner.

Almont, March 15, 1916. Investigation of diphtheria by Dr. W. H. Smith.

Romeo and Dryden, March 16, 1916. Investigation of diphtheria by Dr. W. H. Smith.

Memphis, July 12, 1916. Investigation of smallpox by Dr. W. H. Smith.

Memphis, August 13, 1916. Investigation of infantile paralysis by Dr. W. H. Smith.

Ada Township, Kent County, August 2, 1916. Investigation of infantile paralysis by Dr. C. C. Slemons.

Martin, August 9, 1916. Investigation of smallpox by Dr. C. C. Slemons.

Howell, August 26, 1916. Investigation of smallpox by Dr. H. S. Bartholomew.

Sandusky, September 2, 1916. Investigation of infantile paralysis by Dr. W. H. Smith.

Maurice, September 2, 1916. Investigation of poliomyelitis by Dr. W. H. Sawyer.

Pittsford, August 24, 1916. Investigation of poliomyelitis by Dr. W. H. Sawyer.

Lyons, September 5, 1916. Investigation of anterior poliomyelitis by Dr. F. A. Johnson.

Thornapple Township, Barry County, August 31, 1916. Investigation of infantile paralysis by Dr. C. C. Slemons.

Somerset Township, Hillsdale County, September 19, 1916. Investigation of poliomyelitis by Dr. Walter H. Sawyer.

Clayton, September 6, 1916. Investigation of smallpox by Dr. C. G. Parnall.

Chapin, August 20, 1916. Investigation of infantile paralysis by Dr. A. M. Hume.

Atlanta, August 31, 1916. Investigation of communicable disease by Dr. W. M. Boylan.

Pontiac, July 29, 1916. Investigation of infantile paralysis by Dr. H. S. Bartholomew.

Lansing Township, September 8, 1916. Investigation of infantile paralysis by Dr. H. S. Bartholomew.

Howell, September 14, 1916. Investigation of infantile paralysis by Dr. H. S. Bartholomew.

Albion, September 7, 1916. Investigation of infantile paralysis by Dr. H. S. Bartholomew.

Leonard, September 9, 1916. Investigation of infantile paralysis by Dr. Guy L. Kiefer.

Romeo, September 13, 1916. Investigation of infantile paralysis by Dr. Guy L. Kiefer.

Plymouth, September 21, 1916. Investigation of infantile paralysis by Dr. Guy L. Kiefer.

Paris Township, Montcalm County, September 20, 1916. Investigation of infantile paralysis by Dr. W. T. Dodge.

Barryton, September 26, 1916. Investigation of infantile paralysis by Dr. W. T. Dodge.

Jeddo, September 23, 1916. Investigation of infantile paralysis by Dr. W. H. Smith.

Ada Township, Kent County, September 30, 1916. Investigation of poliomyelitis by Dr. C. C. Slemons.

Plainfield Township, Kent County, October 11, 1916. Investigation of poliomyelitis by Dr. C. C. Slemons.

Marcellus, October 10, 1916. Investigation of poliomyelitis by Dr. A. H. Rockwell.

Bethany Township, October 14, 1916. Investigation of smallpox by Dr. F. A. Johnson.

Pinconning, July 8, 1916. Investigation of diphtheria by Dr. Edward Goodwin.

Tawas City, August 1-2, 1916. Investigation of infantile paralysis by Dr. Edward Goodwin.

East Tawas, September 7-8, 1916. Investigation of infantile paralysis by Dr. Edward Goodwin.

Gladwin, September 11-12, 1916. Investigation of infantile paralysis by Dr. Edward Goodwin.

Addison Township, Oakland County, September 7, 1916. Investigation of infantile paralysis by Dr. D. G. Castell.

St. Johns, September 8, 1916. Investigation of infantile paralysis by Dr. Arthur M. Hume.

Fowler, September 12, 1916. Investigation of infantile paralysis by Dr. Arthur M. Hume.

Eureka, September 19, 1916. Investigation of scarlet fever by Dr. Arthur M. Hume.

Owosso, October 15, 1916. Investigation of smallpox by Dr. Arthur M. Hume.

Walton, October 30, 1916. Investigation of measles by Dr. Julius M. Wilhelm.

Marine City, November 3, 1916. Investigation of typhoid fever by Dr. W. H. Smith.

St. Clair, November 4, 1916. Investigation of smallpox by Dr. W. H. Smith.

Kaleva, November 1, 1916. Investigation of infantile paralysis by Dr. G. O. Switzer.

Wayland, November 5, 1916. Investigation of milk supply by Dr. C. C. Slemons.

White Pigeon, October 23, 1916. Investigation of smallpox by Dr. A. H. Rockwell.

Big Bay, November 1, 1916. Investigation of communicable disease by Dr. F. D. McHarkin.

Bainbridge Township, November 17, 1916. Investigation of communicable disease by Dr. C. N. Sowers.

Menominee and Ingallston Twps., November 13-14, 1916. Investigation of communicable disease by Dr. E. V. McComb.

Mason, September 30, 1916. Investigation of infantile paralysis by H. S. Bartholomew.

Olivet, October 17, 1916. Investigation of smallpox by Dr. H. S. Bartholomew.

Millington, November 19, 1916. Investigation of diphtheria by Dr. Don D. Knapp.

New Lothrop, November 16, 1916. Investigation of smallpox by Dr. Don D. Knapp.

Galesburg, November 1, 1916. Investigation of typhoid fever by Dr. A. H. Rockwell.

Galesburg, November 8, 1916. Investigation of smallpox by Dr. A. H. Rockwell.

Olivet, November 9, 1916. Investigation of poliomyelitis by Dr. A. H. Rockwell.

Powers, December 2, 1916. Investigation of scarlet fever by Dr. A. J. Carlson.

Powers, December 4, 1916. Investigation of scarlet fever by Dr. A. J. Carlson.

Mason, December 8, 1916. Investigation of smallpox by Dr. Chas. F. Lynch.

West Branch, August 12, 1916. Investigation of infantile paralysis.

Richmond, December 19, 1916. Investigation of smallpox by Dr. W. H. Smith.

St. Johns, December 21, 1916. Investigation of smallpox by Dr. H. S. Bartholomew.

Mason, December 31, 1916. Investigation of smallpox by Dr. H. S. Bartholomew.

Haslett, January 8, 1917. Investigation of scarlet fever by Dr. H. S. Bartholomew.

Walton Township, Eaton County, January 16, 1917. Investigation of smallpox by Dr. H. S. Bartholomew.

Hudson, January 26, 1917. Investigation of smallpox by Dr. H. S. Bartholomew.

Delta Mills, January 30, 1917. Investigation of scarlet fever by Dr. H. S. Bartholomew.

Clare, November 13-14, 1916. Investigation of infantile paralysis by Dr. Edward Goodwin.

Mayville, November 20-21, 1916. Investigation of smallpox by Dr. Edward Goodwin.

Mayville, December 2, 1916. Investigation of smallpox by Dr. Edward Goodwin.

Romeo, October 9, 1916. Investigation of infantile paralysis by Dr. Guy L. Kiefer.

Pontiac, November 3, 1916. Investigation of smallpox by Dr. Guy L. Kiefer.

Ypsilanti, November 14, 1916. Investigation of smallpox by Dr. Guy L. Kiefer.

Wayne, November 18, 1916. Investigation of infantile paralysis by Dr. Guy L. Kiefer.

Carland, January 24, 1917. Investigation of smallpox by Dr. Chas. F. Lynch.

Okemos, January 26, 1917. Investigation of scarlet fever by Dr. Chas. F. Lynch.

Coloma, January 24, 1917. Investigation of infantile paralysis by Dr. C. N. Sowers.

Lake Odessa, January 26, 1917. Investigation of scarlet fever by C. C. Slemons.

Owosso, November 8, 1916. Investigation of smallpox by Dr. A. M. Hume.

Newberg, December 7, 1916. Investigation of communicable disease by Dr. A. M. Hume.

Bennington, December 15, 1916. Investigation of communicable disease by Dr. A. M. Hume.

Owosso, December 13, 1916. Investigation of smallpox by Dr. A. M. Hume.

Durand, December 15, 1916. Investigation of communicable disease by Dr. A. M. Hume.

Clinton and Gratiot Counties, January 14, 1917. Investigation of communicable disease by Dr. A. M. Hume.

Galien, February 17, 1917. Investigation of smallpox by Dr. C. N. Sowers.

Galien, February 12, 1917. Investigation of smallpox by Dr. C. N. Sowers.

Dewitt, March 3, 1917. Investigation of communicable disease by Dr. Chas. F. Lynch.

Waldron, March 5, 1917. Investigation of scarlet fever by Dr. Walter H. Sawyer.

Hudson, March 6, 1917. Investigation of scarlet fever by Dr. Walter H. Sawyer.

Dewitt, March 11, 1917. Investigation of scarlet fever by Dr. Chas. F. Lynch.

Alma, February 6, 1917. Investigation of smallpox by Dr. Arthur M. Hume.

Bancroft, February 18, 1917. Investigation of scarlet fever by Dr. Arthur M. Hume.

Deerfield Township, Lenawee County, February 24, 1917. Investigation of scarlet fever by Dr. C. G. Parnall.

Ottawa County, March 17, 1917. Investigation of scarlet fever by Dr. C. C. Slemons.

Ottawa County, March 18, 1917. Investigation of scarlet fever by Dr. C. C. Slemons.

Ottawa County, March 19, 1917. Investigation of scarlet fever by Dr. C. C. Slemons.

Ottawa County, March 22, 1917. Investigation of scarlet fever by Dr. C. C. Slemons.

Ottawa County March 23, 1917. Investigation of scarlet fever by Dr. C. C. Slemons.

Leslie, March 26, 1917. Investigation of communicable disease by Dr. Chas. F. Lynch.

Hudson, January 26, 1917. Investigation of smallpox by Dr. H. S. Bartholomew.

Grand Ledge, February 6-7, 1917. Investigation of scarlet fever by Dr. H. S. Bartholomew.

Dewitt, February 9, 1917. Investigation of scarlet fever by Dr. H. S. Bartholomew.

Mason, February 10, 1917. Investigation of smallpox by Dr. H. S. Bartholomew.

Dewitt, February 24, 1917. Investigation of scarlet fever by Dr. H. S. Bartholomew.

East Lansing, April 9, 1917. Investigation of scarlet fever by Dr. H. S. Bartholomew.

Lakeview, April 17, 1917. Investigation of smallpox by Dr. F. A. Johnson.

Sidney Center, April 1, 1917. Investigation of scarlet fever by Dr. F. A. Johnson.

Ithaca, May 8, 1917. Investigation of smallpox by Dr. H. S. Bartholomew.

Lakeview and Hinton Townships, Mecosta County, April 11, 1917. Investigation of smallpox by Dr. W. T. Dodge.

Millbrook Township, Mecosta County, April 21, 1917. Investigation of smallpox by Dr. W. T. Dodge.

Grant, April 25, 1917. Investigation of smallpox by Dr. C. C. Slemons.

Newaygo County, April 26, 1917. Investigation of smallpox by Dr. C. C. Slemons.

Walker Township, Kent County, May 6, 1917. Investigation of whooping cough by Dr. C. C. Slemons.

Ottawa County, May 7, 1917. Investigation of whooping cough by Dr. C. C. Slemons.

Prattville, April 14, 1917. Investigation of scarlet fever by Dr. W. H. Sawyer.

Imlay City, April 11, 1917. Investigation of scarlet fever by Dr. W. H. Smith.

Allendale Township, Ottawa County, May 14, 1917. Investigation of smallpox by Dr. C. C. Slemons.

Grant, May 15, 1917. Investigation of smallpox by Dr. C. C. Slemons.

Ottawa County, May 16, 1917. Investigation of whooping cough by Dr. C. C. Slemons.

Coopersville, May 17, 1917. Investigation of smallpox by Dr. C. C. Slemons.

Plainfield Township, Kent County, May 17, 1917. Investigation of smallpox by Dr. C. C. Slemons.

Almont, May 20, 1917. Investigation of smallpox by Dr. C. C. Slemons.

Lansing, May 7, 1917. Investigation of communicable disease by Dr. Chas. F. Lynch.

Pontiac, January 18, 1917. Investigation of smallpox by Dr. Guy L. Kiefer.

Highland Park, May 19, 1917. Investigation of smallpox by Dr. Guy L. Kiefer.

Ithaca, April 24, 1917. Investigation of smallpox by Dr. Arthur M. Hume.

Owosso, April 25, 1917. Investigation of smallpox by Dr. Arthur M. Hume.

North Star, May 29, 1917. Investigation of smallpox by Dr. Arthur M. Hume.

Owosso, May 31, 1917. Investigation of scarlet fever by Dr. Arthur M. Hume.

Owosso, June 2, 1917. Investigation of scarlet fever by Dr. Arthur M. Hume.

Owosso, June 9, 1917. Investigation of smallpox by Dr. Arthur M. Hume.

Mackinaw City, May 29, 1917. Investigation of scarlet fever by Dr. W. Earle Chapman.

East Lansing, April 9, 1917. Investigation of smallpox by Dr. H. S. Bartholomew.

Shaftsburg, May 17, 1917. Investigation of infantile paralysis by Dr. H. S. Bartholomew.

Bath, June 6-7, 1917. Investigation of typhoid fever by Dr. H. S. Bartholomew.

Jackson, June 9, 1917. Investigation of smallpox by Dr. H. S. Bartholomew.

Fowlerville, May 21, 1917. Investigation of smallpox by Dr. Chas. F. Lynch.

Fowlerville, May 24, 1917. Investigation of smallpox by Dr. Chas. F. Lynch.

Galien, May 25, 1917. Investigation of smallpox by Dr. C. N. Sowers.

Casnovia Township, Kent County, April 18, 1917. Investigation of communicable disease by Dr. Geo. S. Williams.

Casnovia, Grant and Ashland Townships and Ravenna, April 23, 1917. Investigation of communicable disease by Dr. Geo. S. Williams.

Hastings, June 8, 1917. Investigation of diphtheria by Dr. C. C. Slemons.

Ionia County, June 15, 1917. Investigation of smallpox by Dr. C. C. Slemons.

Flushing, May 25, 1917. Investigation of communicable disease by Dr. Don D. Knapp.

East Tawas, April 25, 1917. Investigation of communicable disease by Dr. Edward Goodwin.

Pinconning, May 9, 1917. Investigation of communicable disease by Dr. Edward Goodwin.

Sherman Township, Iosco County, May 10-11-12, 1917. Investigation of communicable disease by Dr. Edward Goodwin.

Lansing, May 16, 1917. Investigation of communicable disease by Dr. Edward Goodwin.

Hastings, June 26, 1917. Investigation of communicable disease by Dr. Edward Goodwin.

Mackinaw City, June 20, 1917. Investigation of communicable disease by Dr. H. E. Chapman.

Adrian, May 31, 1917. Investigation of scarlet fever by Dr. George Sewell.

Pontiac, January 18, 1917. Investigation of smallpox by Dr. Guy L. Kiefer.

Highland Park, May 19, 1917. Investigation of smallpox by Dr. Guy L. Kiefer.

Adrian, May 31, 1917. Investigation of scarlet fever by Dr. Guy L. Kiefer.

DIVISION OF SANITARY ENGINEERING.

July 1, 1916.

Dr. R. M. Olin, Secretary State Board of Health, Lansing, Michigan.

Dear Doctor:—I hand you herewith my report for the year ending June 30, 1916.

ORGANIZATION OF OFFICE FORCE.

During the past year the work of the Department has increased to such an extent that the three assistants comprising the force at the date of my last report were unable to keep abreast of the demands. We were able to secure the services of Prof. E. L. Waterman, a member of the faculty of Pennsylvania State College, who has had extensive experience in the practice and teaching of sanitary engineering. Prof. Waterman began his labors with us February 7, 1916.

FILING OF PLANS FOR WATER AND SEWER SYSTEMS.

Tables 1 to 6 inclusive, hereto attached, show the progress made to date in the filing of plans for water and sewer systems under the requirements of Act 98, P. A. 1913.

EXAMINATION OF PLANS FOR PUBLIC BUILDINGS.

Table No. 8 shows the list of plans recommended for approval.

CONFERENCES, CONSULTATIONS AND INSPECTIONS.

In Table No. 9 may be found a list, alphabetically arranged, of the visits made during the year for the purpose of assisting municipalities or city officials in solving their problems of sanitation. The growth of this work is shown by months in diagram on page 111. Problems deserving special mention are as follows:

1. *Albion Sewerage:* The city of Albion contemplates a system of combined sewers to serve the second ward. An investigation has been made and the officials advised of the difficulties likely to ensue if the sewers are built in accordance with the proposed designs. The advisability of using the separate system of sewers in Albion has been brought to the attention of the officials.

2. *Alpena Water Supply:* As a result of the investigation of the Alpena water supply made by Mr. Harold G. McGee, and outlined in the annual report of the State Board of Health for 1915, the Mayor was advised under date of May 27, 1915, that a liquid chlorine machine should be substituted for the hypochlorite apparatus then in use and that a Venturi meter should be installed for accurately recording the amount of water pumped in order that the dose of sterilizing agent might be ad-

ministered intelligently. The liquid chlorine machine was installed in October, 1915, but the Venturi meter has not been procured because the city authorities objected to the expense. The changes made will undoubtedly prove to be an improvement over former conditions, but it is to be regretted that all of the recommendations of the State Board of Health were not complied with so as to put the city of Alpena in a position to realize the maximum efficiency from the chlorinating process. Arrangements have been made with a chemist employed at the local cement factory to make a daily analyses of both raw and treated water, and these have been used to some extent as a control of the amount of dose applied. A marked reduction in the number of typhoid cases during the past winter has occurred and it seems only fair to attribute part at least of this decrease to the efficacy of the chlorinating process.

3. *Battle Creek, Pollution of the Kalamazoo River:* A remonstrance has been filed with the State Board of Health signed by a number of persons owning property along the banks of the river, and protesting against the pollution of the stream by the liquid wastes from Battle Creek. A preliminary inspection has been made and detailed investigations deferred until favorable conditions of river stage occur.

4. *Bay View Sewage Disposal:* The Bay View Camp Grounds near Petoskey are equipped with a system of sanitary sewers and septic tank built several years ago under the direction of the Board in control. This summer resort has a population of about 7,000 during the summer months. The effluent from this tank flows through an open ditch about 20 feet to the Bay. The design is faulty and the effluent is, therefore, not of the best quality. A considerable amount of organic matter is being carried over it into the waters of Little Traverse Bay. This forms food for an abundant growth of green plant life which when cast upon the shore by wave action gives rise to offensive odors of decomposition. The Board has been advised to change the construction of the tank so as to produce greater efficiency and to extend the outlet pipe about 1,000 feet into the deep water of Little Traverse Bay.

5. *Birmingham Sewerage and Sewage Disposal:* A system of sanitary sewers has been designed for the village of Birmingham, part of which has been built. An inspection made on August 13, 1915, revealed the fact that these sewers are subject to an abnormal amount of leakage or other inflow of ground or surface water. The designing engineers were informed of this fact and the village advised that every effort should be made to discover the source of this leakage and reduce it to a minimum before the design of disposal works is finished. Some effort has been made to comply with our recommendations.

6. *Brown City Sewerage and Sewage Disposal:* Engineers have been employed to design a system of sewers with sewage treatment. This village is situated on flat ground with no available outlet except ditches which are dry during part of the year. The solution of this problem will be expensive on this account. Imhoff tanks and sand filters have been recommended.

7. *Cadillac Water Supply.* The proposed well water supply referred to in the last report has been developed in an experimental way. Ample quantity of a safe quality seems available from ground water sources, but some objection has been raised to the probable hardness as compared

with the lake water to which the people have been accustomed. A meeting was held with the officials of the Water Company and the City Commission at which time the Company presented a report showing that under existing circumstances it would be a hardship upon the Company to be compelled to build a filter plant large enough to meet the abnormal demands upon the system which occur at frequent intervals. The rate of pumping often reaches 250 gallons per capita per day. It is believed that this is two and one-half times as much as it should be, and that by proper supervision over the consumers it can be brought down to a figure more nearly normal. The peculiar stipulations of the contract or franchise under which the Company is working seriously interfere with proper regulations on the part of the Company. At this meeting it was agreed that the Water Company should make a complete statement of its financial plans, both present and prospective, for the purpose of showing what readjustment of rates and regulations are necessary so that the question can be submitted to the people. Representatives of the Company stated that they were ready to proceed with the construction of a filter plant as ordered by the State Board of Health as soon as an adjustment of rates and regulations for the prevention of wastes was assured. A plumbing code has been adopted by the City Commission which it is hoped will assist in reducing the waste of water.

8. *Canning Factory Waste:* During the summer and early fall of 1915 an experimental plant was operated at the factory of the Fremont Canning Company for the purpose of studying the treatment of canning factory wastes, primarily for the prevention of nuisances in the Darling Creek flowing through the town, and secondly, to obtain information for the guidance of similar factories elsewhere in the state. The experimental work included sedimentation, screening and filtration through sand. Some valuable information was obtained, but owing to the lateness of beginning the work and the shortness of the period during which the various fruits and vegetables are handled no final conclusions were reached.

9. *Dearborn Sewerage.* On April 19, 1916, the State Sanitary Engineer attended a meeting of the Common Council of Dearborn and urged upon them the necessity of employing a competent engineer to design a sewerage system and disposal works, and emphasized the necessity of constructing a part of these sewers at once. We are informed that the village council has passed a resolution authorizing the preparation of complete designs with the expectation of constructing some of the system in the near future.

10. *Dearborn Water Supply.* Since the last report the laboratory at the Ford Filtration Plant has been completely equipped and daily examinations of the raw and treated water are being made.

11. *Detroit Sewage Disposal.* In the last annual report we stated that Mr. C. W. Hubbell had been retained by the City of Detroit to make a study of sewerage conditions looking to the restriction of pollution in the Detroit River. At the time of his appointment the following problems were submitted to him by Mr. Geo. H. Fenkell, Commissioner of Public Works.

"1. That you review the data and conclusions of the International Joint Commission for the purpose of enlarging on any phase of the matter that might be necessary in order to determine what preventive or remedial measures are required with reference to Canadian waters.

"2. To what extent does the City of Detroit's sewage pollute American waters so as to render them unfit as a source of raw water for filtration purposes?

"3. By what means, if any, should the City of Detroit undertake to purify the sewage, and what expense would be justifiable for that purpose?"

The answers to these problems may be found in Mr. Hubbell's report dated May 9, 1916. The following is an abridged form of his conclusions.

REPLY TO FIRST PROBLEM.

"1. From a study of the report and findings of the International Joint Commission and of the additional data collected in the course of this investigation, it is evident that pollution may, and at times undoubtedly does, cross the boundary line from either side in such degree as to render the waters on the other unsafe for drinking or domestic uses without some form of treatment or purification.

"2. The pollution crossing the boundary line from either side has not yet reached such a degree as to render the waters on the other unfit as a source of raw water supply for a water purification plant. * * * *

"3. The unpreventable and inevitable pollution from surface drainage, street wash and other incidental sources is of such degree and character that even the treatment of all sanitary sewage entering the river on both sides of the boundary and the complete sterilization of all pollution from vessels would not obviate the necessity for purification of Detroit River water used for drinking and domestic purposes.

"4. It therefore follows that preventive or remedial measures required with reference to pollution crossing the boundary line from either side should logically be limited to such sewage treatment as may be necessary to prevent an undue burden being placed on any water purification plant having an intake suitably located in the best raw water obtainable within a reasonable distance from the plant. In our judgment such results can best be insured for all future conditions likely to occur, by sterilization of all sewage discharged from vessels, and by eventually collecting all urban sanitary sewage at convenient points where it may be treated either by means of fine screens or settling tanks, followed by sterilization.

"Detroit should anticipate such a system for other reasons than that of preventing pollution from crossing the boundary line.

REPLY TO SECOND PROBLEM.

"1. It is difficult to separate the pollution in American waters caused by Detroit's sewage from that which comes from surface wash and from the sewage of other cities and villages both above and below the city of Detroit. The pollution in the Detroit River hugs the shore lines with remarkable persistence. Adjacent to the American shore a zone of grossly polluted water containing from 500,000,000 B. Coli per 100 c. c., extends the entire length of the river from Lake St. Clair to Lake Erie. The pollution is greatest near the shore and rapidly decreases toward the outer edge of the zone. The width of this polluted shore zone varies somewhat with the seasons and with local weather conditions. * * * * * At any point in this zone the pollution is such as to render the water unfit as a source of raw water for filtration purposes. * * * * * The pollution extends into Lake Erie for 20 or 30 miles in gradually decreasing intensity, until it finally disappears or becomes negligible, due to sedimentation and the efficient purification processes of nature.

"2. The public water supplies most affected are those of Ford, Wyandotte, Trenton and Monroe. The pollution reaching Monroe from Detroit's sewage may at times reach 1,000 B. Coli per 100 c. c., but the sewage pollution from this source is not such as to render the raw water unsuitable for filtration purposes. Ford and Wyandotte can obtain a water suitable for filtration by extending an intake about 3,000 feet into the river. Trenton cannot obtain a suitable supply within reasonable distance or cost, but could do so were Detroit's sewage treated as recommended in this report.

* * * * * * * * * * *

"3. Treatment of sewage would afford a measure of protection to numerous private users of water and would greatly improve the conditions surrounding the summer homes, pleasure resorts and bathing beaches patronized by thousands of Detroit's citizens during the summer months. The removal of solids and objectionable floating matter from the sewage would improve the appearance of the entire river along Detroit's water front, and would in a measure restore cleanly conditions.

"4. Under ordinary conditions, Detroit's sewage does not reach the intake crib of the Detroit water works. However, it is not at all certain that it may not do so under extraordinary conditions. On February 5, 1909, strong easterly winds raised the level of the westerly end of Lake Erie above the level of Lake St. Clair, and for a period of over seven hours the slope of the river was backward. During this period the flow of the river was undoubtedly reversed, although the velocity of the current could not have been great. Similar conditions occurred on January 31, 1914, when back flow probably took place for four or five hours. Back flow in the river may be expected at irregular intervals of about four or five years. Back flow is most likely to occur when there are ice gorges in the St. Clair River, and these conditions must be accomplished by a strong easterly wind on Lake Erie.

"5. The unpreventable pollution from surface wash and storm water sewage which, even with sewage treatment, will inevitably increase with the development of territory above Windmill Point, together with the probability of occasional back flow in the river, justify the construction of a new intake at a point somewhat further removed from the influence of shore pollution. * * * *

REPLY TO THIRD PROBLEM.

"1. Oxidation methods are not required for Detroit conditions on account of the large dilution available in the Detroit River. * * * *

"2. The removal of oil, grease, faeces and other floating matter obnoxious to sight is desirable, and the removal of most of the settleable solids in suspension should also be accomplished in any method of treatment adopted.

"3. The most important requirement in the treatment of Detroit sewage is the removal of pathogenic or disease producing organisms. Studies indicate that a removal of from 90 to 95 per cent of the total bacteria in the sewage will be necessary to reduce the pollution in the river below Detroit to a standard of 500 B. Coli per 100 cubic centimeters for average conditions. This can best be done by the use of a disinfectant, such as hypochlorite of lime.

"4. * * * * * * * * * *

"5. * * * * * * * * * *

"6. It is therefore recommended that treatment by sedimentation combined with disinfection be adopted as the most economical method of purifying Detroit sewage to a degree necessary to meet all present and future requirements. The first cost of a complete installation adequate for a population of 950,000 comprising works at Fort Wayne and at Fairview, together with the necessary systems of collecting sewers, is estimated at $6,091,000. The total annual charge, including interest at 4½ per cent, amortization, operating costs and maintenance, is estimated at $517,430 or 54.5 cents per capita.

"7. In regard to the second part of the problem as to what expense would be justified for sewage treatment, it is difficult to formulate an answer in terms of money alone. However, it is believed that, aside from the international features of the problem, the combined benefits which would accrue from a more cleanly water front, purer water at the bathing beaches and summer playgrounds; reduction in typhoid and other water borne diseases due to the use of sewage laden water along the river front; betterment of raw water supplies for the municipalities below the city, and the protection of Detroit's water supply from gross sewage pollution at times when the Detroit River flows backward; amply justify the expenditure required for sewage treatment works as above outlined. In round figures, the cost would be about six million dollars, and in my judgment the expenditure of this sum would be justifiable."

These conclusions and estimates were reached after exhaustive study of a great mass of information collected by Mr. Hubbell and by the International Joint Commission. Many of the data are given in detail in the report above mentioned.

We have kept in close touch with Mr. Hubbell throughout his investigation and feel that the work was handled in a masterly manner and that the conclusions are logical and fully justified by all the circumstances. We are therefore gratified to know that the city is to embark on a constructive program for the guidance of all of its future sewerage work which will undoubtedly result in vastly improved conditions both with respect to the city itself and to the municipalities along the river below Detroit.

12. *Dundee Water Supply:* The village of Dundee has completed the sinking of a deep 6 inch well for the purpose of prospecting for a suitable water supply. The authorities were informed by the Engineering Division that their chances for obtaining a suitable ground water supply were very remote, but it was the will of the people that an effort be made.

A water high in sulphur was encountered and its mineral content is such as to render it unsuitable for domestic purposes. Although it might be possible to treat the water with chemicals and soften it to a considerable extent the cost of operation would probably be too great in comparison with the benefits received.

13. East Grand Rapids Sewerage and Sewage Disposal: The village of East Grand Rapids has completed a sewer system with disposal works consisting of an Imhoff tank and sand filters. Much ground water was encountered in the construction but it is believed that skillful handling of the problem has resulted in cutting the leakage to a minimum. It was necessary to resort to considerable expense in underdraining the site for disposal works for the lowering of the ground water level. The whole work has been well done and the plant is giving excellent satisfaction.

14. Eloise, Wayne County Infirmary Sewage Disposal: Some years ago a treatment plant for the sewage from this institution was built. It consisted of chemical precipitation by means of lime, alum and sulphate of iron. The growth of the institution has been such as to render the old plant inadequate, and the character of the effluent has become such as to be a menace to the purity of the Dearborn water supply. The old plant is being abandoned and a new one constructed consisting of an Imhoff tank with contact filters.

15. Engineering Bulletins: Since the last report the results of the investigation of the typhoid epidemic and the water supply at Monroe have been published as Engineering Bulletin No. 7. An amplification of Engineering Bulletin No. 3 has been published as Engineering Bulletin No. 8, entitled the "Sanitary Privy." This includes features applicable to country school houses.

16. Flint Typhoid Fever Investigation: During January, 1916, an investigation was made at Flint to determine the source of about 90 cases of typhoid fever. It was traced to the farm of a man who sold milk to a distributing station in Flint.

This farm is located on the Flint River a short distance below the city. It was plainly evident that the cattle were watered in the stream and allowed to wallow in the polluted water and filth deposited in the bottom and along the banks. As the Flint River receives all the sewage of the city of Flint it would seem hardly possible that such carelessness with cattle could fail to result in serious contamination of the milk produced. It was also found that from the previous September to the middle of January there had been employed at the farm a family of two adults and six children, six of whom had suffered from typhoid fever during the previous summer. Through the co-operation of the Health Officer specimens were obtained from these persons which indicated that several of them were typhoid carriers.

This supply of milk had been excluded from the city of Flint at about the time the investigation was begun, and as a result the epidemic soon subsided.

17. Fowlerville Sewerage: Recent investigations in the village of Fowlerville and conferences with the village officials have resulted in the letting of the contract for the preparation of plans for a sanitary sewer system with sewage treatment. The village has an excellent water supply and an adequate system of sewers is needed.

18. French Landing, Garbage Reduction Nuisance: The plant of the Detroit Reduction Company which has the contract of disposing of all the garbage of the city of Detroit is located at French Landing. The process as carried on by this Company consists in the recovery of grease only. The tankage resulting from the process is dumped near by and the waste liquors are allowed to flow into the Huron River. Numerous complaints have been filed with the State Board of Health and with the State Fish and Game Department that the discharge of waste into the stream has resulted in a nuisance and in the killing of fish. The Company finally purchased land on the north side of the river and has made arrangements for pumping the waste liquors on to this land.

During May, 1916, a fire destroyed the plant. It will be rebuilt on more modern lines with equipment for the recovery of more of the valuable constituents of the garbage and thus abate the nuisances heretofore complained of.

19. Grand Rapids Sewage Disposal: Since the past year the report of Hoad & Decker on the sewage disposal problem for the city of Grand Rapids has been accepted and referred to the Common Council. The Board of Public Works was authorized to obtain land for the construction of the works and the firm has been engaged to prepare the final plans.

20. Grand Rapids Typhoid Fever Investigation: A study of the typhoid situation at Grand Rapids is nearly completed. The installation of a filtered municipal water supply on January 1, 1913, did not serve to lower the typhoid death rate as much as had been anticipated. The investigation was undertaken to determine what other factors, if any, were operating to keep the death rate higher than is found in other cities of similar size.

21. Grand River Dredging: Proceedings have been started for dredging and straightening the channel of the Grand River below the Jackson city limits. This project is being undertaken primarily for the drainage of swamp land, but it will also be a great sanitary benefit in providing better drainage and more favorable outlets for the sewage of the city of Jackson. It is expected that upon the completion of this work the city will undertake the improvement of the river within the limits of the corporation. In December, 1915, the State Sanitary Engineer appeared at a hearing before the drainage commission having the proceedings in charge and argued for the project as a necessary sanitary measure. The required legal proceedings seem to be going forward without hindrance.

22. Grand River Sanitary Survey: During June, 1916, the report of the studies of the self purification of the Grand River made during 1914, 1915 and 1916, was completed. The investigation extended from the City of Jackson for a distance of about 25 miles down stream. This portion of the Grand is near its source, and above Jackson it is fairly free from pollution. The river, as it enters the city, is clear and well aerated but carries a small amount of color. During its passage through the corporate limits it receives the sewage of about 33,000 people as well as some industrial waste, ashes, garbage and rubbish which render it exceedingly foul and turbid. The burden of sewage imposed upon the stream is more than the water can carry and sludge beds are formed with consequent nuisances during the warm weather. A sewage disposal plant to care for the flow from nearly all of the city was built in 1907. Due to certain defects in design and to the fact that dredging of the river below the location of the disposal plant was expected but not realized the plant has never accomplished much in preserving the purity of the stream. The quantity of sewage flow is estimated on the basis of the population at about 5 cu. ft. per second. The lowest flow in the river measured during the investigation was 58 cubic feet per second, or less than 12 volumes of river water to one of sewage. This is known to be insufficient to avoid nuisances. In general a proportion of at least 25 to 1 would be required.

Within the 25 miles studied the river receives the flow from Portage Creek and Sandstone Creek, both streams of considerable size besides other smaller tributaries. The work terminated just below the mouth of Sandstone Creek near Tompkin's Center. Seventeen sampling points were used to obtain the following information:

A. Quality of the river water above the sewage pollution of Jackson.

B. Quality of the river water below the sewage pollution at properly selected sampling points down the stream.

C. Quality of the water in the main tributaries furnishing dilution.

D. Amount of flow in the river at Jackson where the pollution enters.

E. Approximate quantity of sewage discharged into the river at Jackson.

F. Amount of flow in the river at several points below Jackson so located as to show the dilution afforded by tributaries entering the stream.

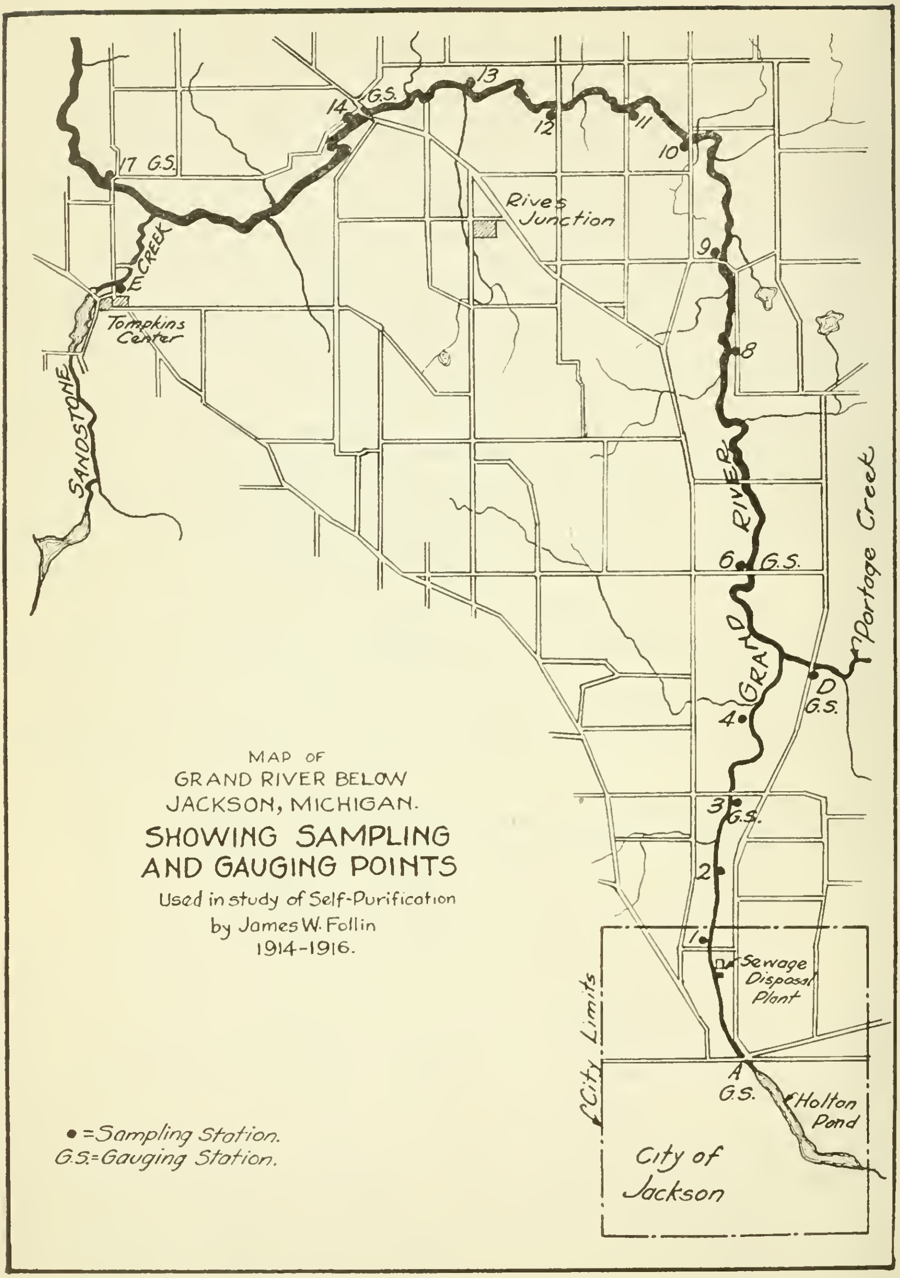
G. Physical conditions relating to self purification, such as weather conditions and temperatures of inflowing sewage and the river water.

H. Estimate of the time of flow between the several sampling stations.

Samples were collected on November 12, 1914, February 17, 1915, April 29, 1915, March 25, 1916, April 22, 1916, and May 6, 1916.

TABLE NO. 1.—*Grand River sanitary survey—composite results.*

	Nov. 12, 1914.	Apr. 29, 1915.	Mar. 25, 1916.	Apr. 22, 1916.	May 6, 1916.
Estimated flow in river at Jackson in C. F. S.	....	54.2	....	....	112
Dilution to estimated average sewage flow	17 Vol.	10 Vol.	25 Vol.	15 Vol.	21 Vol.
Discharge of river at station 3 in C. F. S.	90	....	130	100	175
Discharge of Portage Creek in C. F. S.	135	125.8	240	310	275
Discharge at Station 6 in C. F. S.	225	180	370	410	450
Dilution at Station 6 to estimated average sewage flow	44 Vol.	35 Vol.	73 Vol.	81 Vol.	89 Vol.
Discharge at Station 10 in C. F. S.	....	....	....	600	555
Discharge at Station 14 in C. F. S.	....	187	450	650	580
Discharge at Station 17 in C. F. S.	....	260	700	960	780
Final dilution at Station 17 to estimated average sewage flow	....	51 Vol.	139 Vol.	191 Vol.	155 Vol.
Chlorine in water above sewers P. P. M.	....	....	....	6.5	7.0
Chlorine at Station 1	9.2	14.0	13.0	13.5	13.0
Chlorine at Station 3	9.2	....	14.0	11.5	13.5
Chlorine at Portage Creek	3.7	....	7.0	3.5	
Chlorine at Station 6	10.4	12.0	9.5	7.0	11.0
Chlorine at Station 10	8.5	....	9.5	7.0	9.5
Chlorine at Station 14	7.3	7.0	7.0	7.0	8.0
Chlorine at Sandstone Creek	3.7	....	4.5	5.5	6.5
Chlorine at Station 17	6.1	7.0	7.0	7.0	6.0



MAP OF
GRAND RIVER BELOW
JACKSON, MICHIGAN.
SHOWING SAMPLING
AND GAUGING POINTS
Used in study of Self-Purification
by James W. Follin
1914-1916.

● = Sampling Station.
G.S. = Gauging Station.

TABLE NO. 2.—*Grand River sanitary survey—composite results.*

	Nov. 12, 1914.	Feb. 17, 1915.	Apr. 29, 1915.	Mar. 25, 1916.	Apr. 22, 1916.	May 6, 1916.
Dilution in volumes at Jackson	17	....	10	25	15	21
Total bacterial count at Station 1	30,000	2,000	....	63,600	40,000	40,000
Total bacterial count at Station 3	70,000	1,500	....	48,000	34,000	33,000
Total bacterial count at Portage Crk	200	....	....	40,800	5,400	5,000
Dilution in volumes at Station 6	44	....	35	73	81	89
Total bacterial count at Station 6	800	300	....	14,760	5,000	6,000
Total bacterial count at Station 10	400	500	....	33,600	12,000	24,000
Total bacterial count at Station 14	300	....	....	32,400	5,000	6,000
Total bacterial count at Sandstone Creek	250	....	....	19,200	6,000	3,000
Total bacterial count at Station 17	700	....	....	13,200	3,600	9,000
Dilution in volumes at Station 17	....	....	51	139	191	155
B. Coli per 100 c. c. at Station 1	100,000	10,000	....	10,000	1,000	3,000
B. Coli per 100 c. c. at Station 3	100,000	10,000	....	1,000	1,000	3,000
B. Coli per 100 c. c. at Portage Crk.	100	....	....	100	—100	100
B. Coli per 100 c. c. at Station 6	1,000	1,000	....	1,000	1,000	1,000
B. Coli per 100 c. c. at Station 10	1,000	100	....	1,000	1,000	100
B. Coli per 100 c. c. at Station 14	100	....	....	1,000	1,000	100
B. Coli per 100 c. c. at Sandstone Crk.	—100	....	....	1,000	—100	100
B. Coli per 100 c. c. at Station 17	100	....	....	100	100	100
Dissolved oxygen in per cent saturation in						
Uncontaminated river water	....	....	87.0	....	....	....
Station 1	....	....	34.6	....	....	69.5
Station 3	....	....	....	....	....	85.6
Portage Creek	....	....	....	....	....	....
Station 6	....	....	45.0	....	....	69.0
Station 10	....	....	....	....	....	....
Station 14	....	....	74.7	....	....	92.0
Sandstone Creek	....	....	....	....	....	59.0
Station 17	....	....	79.5	....	....	80.0

In tables Nos. 1 and 2 are shown those results from all of the sampling trips which give information from which conclusions can be drawn. Table No. 1 shows that on the five days listed that the dilution at Jackson ranged from 10 to 25 volumes, with an average of 17.6 volumes. The estimated dilution at station 6 showed a range of from 35 to 89 volumes with an average value of 64.4 volumes, which is 3.6 times the dilution at Jackson.

At Station 17, the dilution compared to the estimated sewage flow ranged, on the four days when measurements were possible, from 51 to 191 volumes, with an average of 134 volumes.

It must be borne in mind that no sampling trips were made during the low water stages of the river, the nearest approach to this being the trip on April 29, 1915. On this day the estimated dilution at Jackson was only 10 volumes as compared with the average of 17.6 for five trip days, and the dilution at Station 6 was only 35 volumes as compared with an average of 64.4 for the five trips or slightly more than 50 per cent of this.

For the days on which the samples were taken there was a sharp change in the quality of the water when Station 6 was reached. This was due to the large dilution of clear water of fairly good quality from Portage Creek. In all cases the flow from Portage Creek exceeded the flow in the river itself at the point of confluence.

Factors Operating for Purification: Of the various factors operating for purification those of sedimentation and dilution play the most prominent part. In this particular instance they largely obscure the other smaller factors. The actual conditions found in the Grand River below Jackson are most favorable to rapid purification. From the sewage disposal plant to the confluence with Portage Creek, a distance of 4.73 miles, the flow is very sluggish and excellent opportunity is afforded for subsidence of the coarser solids. The river is more than doubled in volume by the flow from Portage Creek with water of fairly good quality and is more than doubled again in the distance from Portage Creek to Station 17. This dilution water furnishes oxygen for the oxidation of those solids in fine suspension and solution which are in the river water when it reaches Portage Creek and for the repletion of the oxygen content of the stream.

In general, specific signs of sewage pollution were visible from the first sewer outlet in Jackson to the last point at which the river was inspected before reaching Portage Creek, or at Station 4. The points noted were turbidity in the river water itself and deposits of filth both in the bed of the river and on the banks. The water at Station 6 did not show signs of sewage pollution. The conditions noted are those prevailing on the days when this study was made which, it must be remembered, did not cover low water stages of the river. Possibly under the latter conditions of flow there would be some visible sign of the pollution noticeable at Station 6.

Purification from Station 1 to Portage Creek: As previously noted the river flow in this stretch is exceedingly sluggish and excellent opportunities are afforded for sedimentation. The average rate of flow for the cross section at Station 3 was 0.5 ft. per second on November 12, 1914; 0.66 ft. per second on March 25, 1916; 0.54 ft. per second on April 22, 1916; and 0.87 ft. per second on May 6, 1916. 1.5 to 2.0 ft. per second is used as the minimum velocity for the self cleansing of sewers and velocities below this would probably cause deposits of sewage solids. The velocities shown for the cross section of the river at Station 3 are less than one-half of these minimum values, thus allowing sedimentation which would be more pronounced during low stages of the river with the tendency to deposit the solids closer to Jackson.

As long as oxygen is present in free or easily reducible forms this organic matter will be taken care of without offense. When, however, the reactions consume oxygen faster than it is absorbed from the surface or is brought to it by the dilution from tributaries, then the critical point is reached and a new series of bacterial activities is set up. These are reducing actions instead of oxidizing actions which partially break up the organic compounds into unoxidized bodies with the production of foul-smelling gases, such as hydrogen sulphide. Thus purification has been succeeded by putrefaction.

Theoretically while any dissolved oxygen remains in the stream there would not be putrefaction; practically, however, when the saturation value is below 50 per cent malodorous conditions are likely to occur. The dissolved oxygen values found on April 29, 1915, show that the saturation value at Station 1 was only 34.6 per cent while that at Station 6, after a dilution of about two times the river flow it was as low as 45.0 per cent. The conditions on this day would indicate the existence of putrefaction instead of purification from Jackson to Portage Creek. Under low water conditions still lower saturation values would be expected.

The river at Jackson is undoubtedly greatly over-burdened with sewage and in low flow at high temperatures must produce unbearable nuisances in the portion of its flow to Portage Creek. The following is the statement made by George A. Johnson of Hering's and Goodnough's relations between sewage and stream flow in dilution volumes.

PROPORTIONS OF SEWAGE WHICH CAN BE DISCHARGED INTO A STREAM WITHOUT PROBABILITY OF NUISANCE.*

Authority.	Nuisance Probable.	Nuisance Improbable.
Hering	1 to 16	1 to 45
Goodnough	1 to 23	1 to 36

*From Kinnicutt, Winslow and Pratt's Sewage Disposal.

A reference to Table No. 1 shows that the dilutions afforded at Jackson have been very low during comparative high water flow. The dilution on April 29, 1915, the lowest stage studied, was 1 to 10, and it must be much less for low flow.

The bacterial self-purification which has been shown down to Portage Creek has not been very marked but below the mouth of the creek there is sharp reduction in numbers which would ensue from the dilution with purer water. There has not been a notable increase of bacteria, of the types which were tested for, in the portion of the flow down to Portage Creek, but it is possible that this was due to the comparatively short time during which the unfavorable environment was acting to cause the dying of the specific sewage types.

Because of the non-existence of low water stages during this investigation it was not possible to study profitably the flora of the stream and to determine its relation to self-purification. This should furnish an interesting study at some future time when the river stage is low.

Purification from Portage Creek to Station 17: The oxidation occurring from Portage Creek down to Station 17 is probably due in a large part to the dilution furnished by water of high dissolved oxygen saturation value, thus raising the oxygen content of the stream. The results shown for the dissolved oxygen tests on May 6, 1916, do not bear this out as a whole because a low value is shown for Sandstone Creek which apparently is the cause of the drop in saturation from Station 14 to Station 17.

These results are from samples collected when the river was fairly high from heavy rains. Under such conditions erratic results might be expected. Just what would be the progress of the oxidation during low flow and what would be the controlling factors is difficult to say because of lack of opportunity to study such conditions. However, it is doubtless true that dilution would play the most important part.

The dissolved oxygen results from samples collected on April 29, 1915, as listed on Table No. 2 indicate a rapid oxidation from Portage Creek to Station 17. The river on that date was at the lowest stage studied but showed re-oxidation from a low value of 34.6 per cent—value for Station 3 assumed as that of river at its junction with Portage Creek—to 79.5 per cent in its flow from Portage Creek to Station 17, a distance of 17.7 miles. The oxidation from Station 6 to Station 17 was from 45.0 per cent to 79.5 per cent in a river flow of 15 miles where the flow was augmented approximately 50 per cent by dilution. If we assume that the water entering from the tributaries was of 87 per cent saturation—the same as was found for the uncontaminated river water above Jackson—the mixture in the proportions mentioned would give a water with only 59 per cent saturation at Station 17, whereas the value found is 79.5 per cent. It is evident therefore that other factors enter into its oxidation besides the mixture with water of higher saturation value.

The studies made would lead to the conclusion that dilution with purer water together with the purification brought about by bacterial processes in the stream itself, effect the improvement in the quality of the river water from Portage Creek to Station 17. The oxygen required for this bacterial action was probably either derived from the more saturated water entering in the tributary streams, or by absorption from the air.

General Conclusions: This study has shown conclusively that the river at Jackson is overburdened with sewage and that relief must be afforded by means of sewage treatment before discharge into the river. Work is now under way to revamp the sewer system and to provide proper treatment for the sewage. The dredging of the river below Jackson together with the straightening of the channel have been planned and with the distance shortened to Portage Creek, attended by greater velocity of flow, conditions should be much improved.

As a plain self purification study it would be more profitable to give close attention to the portion of the river from Jackson to Portage Creek rather than attempting to follow the sewage flow as far as it is done in this investigation. At Portage a large dilution is obtained and some smaller streams enter at short distances from here to Station 17. Since no new pollution comes in, the study from Portage to Station 17 is little more than an observation of the amount of dilution, and the resulting decreases in chemical values and bacterial contents.

The 4.75 miles from the sewage disposal plant to Portage Creek must, during low water, show an intensification of the factors of self purification which would justify its close study with samples at short intervals and with observations of the flora. There is undoubtedly an excellent opportunity afforded to study the connection of the flora with the degree of purification and to obtain information on certain of the questionable factors in the self-purification of streams.

23. Hillsdale County Infirmary Sewage Disposal: A sewage disposal plant was built at the Hillsdale County Infirmary in the fall of 1915. It consists of a small Imhoff tank followed by sand filtration. The tank has never been particularly efficient owing to its small size, also to the fact that it was designed according to the proportions of larger installations. The sludge pit consists of a well built by sinking large sized sewer pipe into the ground to a depth of about 30 feet. The upper portion is built of concrete. The sludge digestion in this tank has been very imperfect, which seems to be due largely, if not entirely, to the size and shape of the digestion compartment, there being insufficient room horizontally to allow free circulation of the gas bubbles and sludge particles. Considerable foaming was experienced at first but this was decreased by drawing off some of the partially digested sludge. The difficulty has not, however, been entirely eliminated. This is another instance which goes to show that small plants should not be designed with the same proportions as large installations.

24. Howell Sewage Disposal: A petition signed by ten persons protesting against the condition of the Shiawassee River below the outfall of the main sewer of Howell was filed with the State Board of Health and asking that action be taken to compel the improvement of the objectionable conditions. Howell has quite recently completed a comprehensive sewer system designed by a firm of well known engineers but the topography was such that it seemed impossible to provide for a sewage disposal plant without pumping. Inasmuch as the Shiawassee River is little more than a county ditch at this point it would seem that treatment of the sewage at Howell would be inevitable, but owing to the fact that pumping is necessary more expense would be necessary to bring this about than would be the case if plenty of fall were available.

25. Ice Inspections: During February, 1916, nine localities were visited, nine ice fields inspected and 16 samples collected. Bacterial examinations of these samples revealed traces of contamination in five of them, but in only two cases did the pollution seem great enough to be dangerous to public health. Steps have been taken to protect the public from the polluted supplies. Most of the ice fields visited show improvement over last year's conditions in the methods of harvesting.

26. Jackson Sewerage and Sewage Disposal: It is already noted under the head of "Dredging of Grand River" that the city of Jackson has taken an active interest in this project and has made arrangements to have a thorough survey of the city made for the purpose of designing, or rather re-designing the sewerage system. This study will take into account what is necessary in the way of treatment for the sewage which is discharged into Grand River.

27. Kalamazoo, Pollution of Portage Creek: During May, 1916, an inspection was made of the conditions of Portage Creek which flows through the eastern portion of the city of Kalamzoo. This investigation was made in response to a complaint that the stream was being polluted by sewage, and also by the discharges from the large paper mills located on the creek. Improvement of the creek has been recommended to the city officials by paving the bottom with concrete and constructing side walls with conduits in them for the sanitary sewage, thus keeping the pollution out of the stream and providing against the accumulation of weeds and trash now so numerous in the creek.

28. Kent County Poor Farm Sewage Disposal: With the construction of a new building at this institution it became necessary to increase the sewage disposal facilities. Inasmuch as the old plant was poorly designed it was decided to construct a new one. Plans prepared by a Grand Rapids firm of engineers were submitted to this department and approved. The treatment consists of sedimentation in an Imhoff tank with discharge into a small stream flowing near the building. Sufficient dilution water is available and the plant is giving satisfactory results.

29. Lapeer, Michigan Home and Training School: As noted in the last Annual Report plans were prepared in this office for overhauling the sewerage system and treatment plant at the Home. The re-design of the system provided for raising the level of the main outfall about 4 feet, thus enabling the construction of a treatment plant which would operate by gravity. The changes in the sewer are well under way but no work has as yet been done on the treatment plant.

30. Mackinac Island, Typhoid Fever Investigation: During October, 1915, at the request of several prominent summer residents of the Island a representative of the State Board of Health undertook a thorough investigation of the causes of a typhoid fever outbreak during the previous summer. Only about a dozen cases in all occurred at this resort, but inasmuch as the healthfulness of the place had never before been questioned it was thought necessary to follow this matter up thoroughly. The study disclosed the fact that most if not all of the patients were heavy milk drinkers. It was found that the milk furnished to these patients was all supplied by one dairy. The sanitary conditions at the dairy were not good. The outhouse used by the employees was not far from the milk house, and the milk house was unscreened. It was, therefore, evident that, should feces containing typhoid germs be deposited in this privy, the infection could easily be transmitted to the milk through the medium of flies.

Two employees at this dairy gave histories of having had typhoid fever. One of these, Mrs. Jas. Green, was isolated in a hospital in Chicago and found to be a typhoid carrier, having had the fever in 1886, 29 years before. This investigation was a very interesting one from the fact that this was the first instance that has come to our notice of a carrier being capable of spreading the disease so long after having had it.

31. Mason Sewerage: The city of Mason has again voted on the proposal of installing a sewerage system but the question was defeated at the polls.

32. Menominee Water Supply: During 1915 two elections were held at Menominee relative to the purchase of the property of the Menominee Water Co. Both of these elections resulted favorably for municipal ownership. Pursuant to the vote of the citizens of Menominee the municipality took possession of the property on February 26, 1916. On April 21, 1916, the State Sanitary Engineer met with the Board of Public Works of Menominee for the purpose of discussing the proper water supply for the municipality. A modern filtration plant of the rapid sand type was recommended. In response to this recommendation a firm of well known engineers was employed by the Board of Public Works to prepare plans and supervise the construction of a filter plant. We have examined these plans in a general way and approved them in their main features. On June 29th the contract was let to the Pittsburgh Filter Co. for the construction of the works.

33. Midland Water Supply: The city of Midland obtains its water from the Chippewa River and the quality is very bad. In 1912 several deep wells were driven and it was proposed to furnish the citizens with water from these wells for domestic purposes. Tests were made at our laboratory on samples taken from the wells, which showed that it was of excellent quality, both bacterially and chemically.

The wells were put into operation during April, 1915, and in a very short time the character of the water changed completely. This is accounted for by the fact that the ground in this locality is punctured with abandoned salt wells. A great many casings of these have rusted off and polluted surface water finds ready access to the ground water. The whole ground water supply has thus become contaminated and it is impossible to supply the city with pure water from wells.

34. Monroe Sewerage: We have been advised that a firm of consulting engineers has been employed to make a design for the reconstruction of the Monroe sewer system. This is a much needed improvement and we hope that it will be carried to an early completion.

35. Monroe Water Supply: The city of Monroe is furnished with water by the Monroe Water Co. The supply is taken from Lake Erie at such a point as to be subject to contamination from the polluted River Raisin which flows through the city of Monroe and possibly by the sewage of Detroit and other towns along the Detroit River. Numerous complaints have been filed with the State Board of Health in regard to this water supply and its purity has been under suspicion at least as far back as 1908. It has been the subject of several investigations of more or less frequency and thoroughness since that time. In 1909, as a result of an investigation, filtration of the public water supply was recommended to the Monroe Water Co. During the summer of 1915 an investigation was made of a typhoid fever epidemic of about 44 cases. During this time it was learned that the citizens had become dissatisfied with the quality of the lake water supplied by the Water Company and the city had constructed several deep wells on street corners for the benefit of the neighboring residents. These extended some distance into the rock and were regarded as deep wells. The rock underlying the city of Monroe is of a highly stratified nature and extends to within 10 or 12 feet of the surface. Many of the sewer trenches were excavated several feet into this loose rock, and at times when the sewers were overcharged with storm water a pressure is set up within the pipes and outward leakage very easily takes place, with consequent pollution of the ground and seepage into the seams of the rock. This pollution readily finds its way into some of the deep wells and several of them showed serious contamination. After exhaustive examinations of these wells several were condemned and closed.

During the investigation hypochlorite treatment of the water supply was installed as a temporary expedient. A liquid chlorine machine was substituted during October, 1915. On December 20, 1915, a hearing was given the Monroe Water Co. and city officials by the State Board of Health at a meeting held in Detroit. The situation was thoroughly explained and filtration urged upon the Water Company. At this hearing it developed that the financial arrangements between the city and the company were not such as to allow the company to build a filter plant and maintain a reasonable rate of profit. Steps were taken shortly afterwards to arrange the matter by having the electorate authorize a change in the city charter whereby a new franchise might be granted the Water Company with rates so adjusted as to permit the Water Company to construct and maintain a filter plant.

The report of the epidemic above mentioned consumed considerable time and was very exhaustive. It has been published as Engineering Bulletin No. 7 of the State Board of Health.

36. Negaunee Sewerage: The city of Negaunee obtains its water supply from Teel Lake. There are several mine locations along the southern shore of the lake and about 40 houses have been built. Some of the houses are so near the lake that there is danger of pollution finding its way from the outhouses into the lake. An inspection of the conditions was made on May 29, 1916, and the city officials were advised to construct a sewer which would take care of the sewage from this location.

37. Redford Sewerage: A conference has been held with the engineer of Redford and a discussion took place at that time relative to the requirements necessary for this rapidly growing community. As Redford is situated on the River Rouge, which is used as a water supply for the village of Dearborn, it is desirable that sterilization follow whatever other treatment may be deemed necessary. The engineer was so informed and he will take this into consideration in making his designs.

38. Reed City Sewerage and Sewage Disposal: After one or two unsuccessful efforts the village of Reed City has decided to build a sewer system and sewage treatment works. The treatment will consist of coarse screens followed by sedimentation in a two story tank of the shallow type with discharge of the tank effluent into the Hersey River. As there is ample dilution available for tank effluent in this stream no nuisance is likely to be created. A contract has been let for the work and an early completion is expected.

39. Report of Water Treatment Plants: Since January 1, 1916, monthly reports covering the daily operation of all the water treatment plants in the state have been required to be submitted to the State Board of Health, in accordance with a resolution passed by that body. We believe that this is the most important step in advance taken by the department since the law giving us authority over the water supplies of the State took effect in 1913. The purpose of these requirements is to place before us a continuous record of the daily operation of each of the treatment plants in order that we may be thereby better enabled to give intelligent advice should any of them show evidence of pollution due to improper management. Standard blanks have been prepared and furnished to the municipalities leaving a space for each of the required tests, and this report is to be sent in to the office on or before the 10th of each month covering the daily operation of the previous month. For some time we have been in serious doubt concerning the efficacy of disinfection by hypochlorite as practiced by most of the municipalities in the state using that system. The reports coming in have confirmed our fears and have shown that in many cases there has developed a sense of security in the use of treated water by no means justified by the results of tests. We believe that the disinfection of public water supplies is a valuable means of treatment unless too much is expected of it, or in other words, the changing conditions must be met by variations in the treatment, and constant and careful supervision is absolutely necessary. In some cases complete treatment by means of filtration and sterilization is necessary, but owing to particular circumstances in the various municipalities the ultimate results cannot be realized at present so that the disinfection method is used as a temporary expedient in such instances. Especially is the laboratory control of the treatment absolutely necessary in order to obtain results even approximately satisfactory.

For the above reasons we have conducted a vigorous campaign for the installation of laboratories where they were not already in use, and have the following results to report. Of the six filtration plants five are now under scientific control. The remaining one has not yet been able to obtain a suitable man for this purpose, and we are continuing to urge that every effort be made to secure a bacteriologist. Of the 22 sterilization plants 15 are now under laboratory control and two are installing the required apparatus. Of the other five one employs treatment only at intervals, and negotiations are pending with the remaining four. Ten of the 22 plants are using liquid chlorine and 12 of them hypochlorite of lime. Several others are contemplating a change from bleach to liquid chlorine. We are encouraging this change not only on account of the difficulty in obtaining bleach, but also because we are convinced that liquid chlorine is more efficient and lends itself better to the graduation of the dose in proportion to the water pumped. Not all of the plants, we regret to say, are dosing the water in proportion to the amount pumped and in proportion to the bacterial condition of the raw water, but we hope that the necessity for this will soon be brought to the attention of the delinquent ones with sufficient emphasis to induce them to install the process and to equip themselves with a laboratory for controlling the dose.

40. River Rouge Sanitary Survey: As noted in previous annual reports Mr. Henry Ford of Dearborn, constructed a filter plant, primarily for the purpose of furnishing pure water to his estates and secondarily for the benefit of the citizens of Dearborn. Mr. Ford has become intensely interested in the sanitary quality of the River Rouge above the Dearborn water intake, and through one of his agents offered to finance a sanitary survey of the river. This investigation has been in progress since the first of January. The work is being carried on under the direction of the State Board of Health. Mr. Ford's idea was to furnish the State Board of Health with information concerning the amount and character of the pollution in the several branches of the River Rouge so that we can institute whatever corrective measures may seem necessary for the protection of the Dearborn water supply. Frequent analyses have been made of samples collected at some 20 points together with gaugings of the flow and inspection of the sanitary conditions of the various municipalities on the drainage basin. Those inspected were Dearborn, Wayne, Plymouth, Northville, Farmington, Redford and Birmingham besides the two institutions, Wayne County Infirmary and St. Joseph's Retreat. Inasmuch as the survey was carried on almost entirely during high stages of the river the results of the work were incomplete. Generally information obtained during low water conditions is more desirable when the dilution afforded the sewage flow from the municipalities is very small and there would be greater chances of the creation of nuisances along the river and a more serious menace to the bacterial purity of the Dearborn supply.

Mr. Ford has requested that the Board continue the work already begun as long as it is necessary to study the various phases of the river. It is hoped that this can be undertaken as soon as the other work of the office will permit.

41. Royal Oak Sewerage and Sewage Disposal: The village of Royal Oak is situated a short distance north of the city of Detroit, and is rapidly becoming a suburban community whose residents are employed in the city. On account of its popularity in this respect the community is growing quite rapidly. Being situated on flat land it has experienced the usual difficulties of drainage and sewerage incident to such localities. The village is very improperly sewered. A number of land drains have been laid and these at the present time are carrying the overflow from septic tanks and cesspools as well as raw sewage. These drains empty into open ditches, some inside the village and others just outside the corporation. These ditches have been a source of annoyance for some time and several visits have been made in the past on account of complaints caused by the conditions of these drains and ditches.

In the fall of 1915 a conference was held with the village president in regard to the sewer conditions and requirements. During this conversation it developed that the village council proposed to pave several streets but had made no provision for the construction of sewers before paving. The president admitted that this was a short-sighted policy and stated that the matter had been repeatedly brought to the attention of the council but no action had been taken. Inasmuch as there is no stream large enough to afford any appreciable amount of dilution complete treatment of the sewage will be necessary in this case. Probably no less a degree of purification will be required than that produced by an Imhoff tank and sand filters.

On March 10, 1916, a hearing was held in Detroit by the State Board of Health at which three of the Royal Oak councilmen appeared. The requirements of the situation were explained to them and they informed the Board that on account of the nearness of the coming election it would be unwise for them to attempt any action before the advent of the new council.

In response to a request from the city clerk the State Sanitary Engineer attended a meeting of the common council of Royal Oak on April 1, 1916, and explained to them the necessity of a thorough survey and study for the design of a proper sewerage system. Action was taken and a well known firm of engineers was employed for this purpose.

42. Saginaw Water Supply: On December 3, 1915, the city of Saginaw made its seventh attempt to have the voters authorize the construction of a modern filtration plant to furnish pure water to its citizens, but the proposition was defeated by a decisive vote. The result of this election was exceedingly discouraging, especially from the fact that it seems to be due to local jealousy and to partisan feeling rather than to a broad consideration of the needs of the city. It is believed that drastic action by the State Board of Health is the only thing that will accomplish results in the city of Saginaw with respect to a pure water supply.

43. Sewage Disposal Plants in New York State: Through the kindness of the Board of State Auditors, the State Sanitary Engineer was allowed to visit the disposal works at Saratoga, Gloversville, Schenectady, Eastwood, Batavia and Newark, New York. The types of treatment visited are as follows:

Saratoga:—Septic tank and sand filters.

Gloversville:—Coarse screens, Dortmund tanks (preliminary), fine screens, sprinkling filters, Dortmund tanks (final) and sand filters.

Schenectady:—Coarse screens, Imhoff tanks and sprinkling filters.

Eastwood:—Imhoff tanks and sprinkling filters.

Batavia:—Imhoff tanks and sprinkling filters.

Newark:—Coarse screens, grit chambers, Imhoff tank, sprinkling filters and final sedimentation.

The trip was very instructive since each installation presents one or more phases of the disposal problem not found in any of the others, nor generally met with in treatment practice. This is particularly true at Gloversville where the sewage is very foul, on account of the large volume of trade waste from the leather industries, which finds its way into the sewers. Here, six successive forms of treatment are necessary to produce an effluent suitable for discharge into a small creek. It is doubtful if another case is in existence where so extensive methods are required.

44. Sturgis Sewage Disposal: In the last annual report it was noted that some difficulty had been experienced at the sewage disposal plant at Sturgis due to the unwise design of the sedimentation tanks. In July, 1915, an inspection was made and it was found that the accumulation in the tank could be removed only with great difficulty and that failure to clean these tanks was probably the cause of the damage to the efficiency of the filters. In accordance with these findings the matter was laid before the officials at Sturgis with recommendations that changes in the bottom of the tank be made. After some discussion of the matter the council authorized the Superintendent of Public Works to proceed with the improvements. The reports have been completed in accordance with our suggestions and a subsequent inspection indicated that the cleaning of the tank had produced the desired results.

45. Tannery Waste Disposal: Not very much progress has been made in this field of investigation since that noted in the last annual report. The Imhoff tank mentioned therein does not give very satisfactory results on account of the large amount of hair contained in the waste which finds its way into the sludge compartment and interferes with digestion and makes the removal of sludge very difficult.

Arrangements have been made to test the efficiency of the activated sludge method of sewage disposal on tannery wastes at the plant of the Wallin Leather Co. of Grand Rapids.

46. Wyandotte Heights Typhoid Fever Investigation: During 1915 a typhoid fever epidemic of small proportions was investigated at the unincorporated community of Wyandotte Heights along the Detroit River below the city. It was found to be due to polluted shallow wells which abound in that locality. The Sibley Quarry, owned and operated by the Solvay Process Co. of Detroit, is located about one mile south of Wyandotte Heights. This company has installed a rapid sand filter and hypochlorite treatment plant for the use of their employees at the works and has piped the water into the houses of those living in the vicinity. A number of employees of the company live in Wyandotte Heights, and an effort was made to pursuade the company to extend their mains to supply not only their own employees but the other residents of this locality, but without success.

47. Yale Sewerage: During 1915 complaints were lodged with the State Board of Health against the insanitary condition of certain ditches and storm sewers in the village of Yale. An investigation was made and the size of the storm sewers necessary to be built determined by this department. After some consultation and discussion the sizes were somewhat modified. It was agreed at this conference that no crude domestic sewage be allowed in the storm sewers but that cesspools and septic tank overflows would be allowed temporarily, pending the construction of sanitary sewers.

48. Zeeland Water Supply: On December 21, 1915, the citizens of Zeeland by vote authorized the issue of bonds for utilizing the new deep wells west of the city, and consequently that supply was substituted for the old insanitary supply from a shallow well in the midst of town which was subject to contamination. Upon the completion of this change sterilization became unnecessary and was abandoned.

Respectfully submitted,
EDWARD D. RICH,
State Sanitary Engineer.

TABLE NO. 1.—*Showing municipalities whose question sheets on Public Water supply have been accepted to July 1, 1916.*

Addison*
Adrian (P)
Ahmeek*
Akron*
Albion
Allegan
Alma
Almont
Alpena
Applegate*
Ann Arbor
Armada
Ashley*
Athens
Au Gres*
Augusta*
Au Sable*
Bad Axe
Bangor
Baldwin*
Baltic
Bancroft
Baroda*
Barryton*
Battle Creek
Bay City
Bear Lake*
Beaverton
Belding
Bellaire (P)
Belleville*
Bellevue*
Benton Harbor
Berrien Springs
Bessemer
Big Rapids
Birmingham
Blissfield*
Bloomingdale*
Boardman*
Boyne City
Breedsville*
Brighton*
Brimley*
Britton*
Bronson*
Brooklyn*
Brown City
Buchanan
Buckley
Burlington*
Burr Oak*
Cadillac (P)
Caledonia*
Calumet Twp. (P)
Camden*
Carleton*
Caro (P)
Carson City
Carsonville
Caseville*
Casnovia*
Cass City
Cassopolis
Cedar Springs
Central Lake (P)
Centerville (P)
Charlevoix
Charlotte
Chesaning
Clare
Clarkston*
Clayton*
Clifford*
Climax*
Clinton** (P)
Clio
Coldwater
Coleman*
Coloma (P)
Colon*
Columbiaville (P)
Concord*
Constantine
Coopersville
Copemish*
Corunna
Croswell
Crystal Falls
Custer*
Daggett*
Dansville*
Davison*
Dearborn
Decatur
Deckerville*
Detroit
Dexter*
Dimondale*
Douglas*
Dowagiac
Dryden*
Dundee*
Durand
Eagle*
East Grand Rapids
East Jordan
East Lake (P)
East Lansing
East Tawas
Eaton Rapids
Eau Claire*
Edmore
Edwardsburg*
Elberta*
Elk Rapids (P)
Elkton
Elsie*
Emmett*
Empire
Escanaba (P)
Essexville
Evart
Fairgrove*
Farmington
Farwell
Fenton
Fife Lake*
Flint
Flushing
Ford (P)
Forestville*
Fountain*
Fowler**
Fowlerville
Frankenmuth*
Frankfort
Frazer*
Freeport*
Fremont
Fruitport*
Gagetown
Gaines*
Galesburg
Galien*
Garden*
Gaylord
Gladstone
Gobleville*
Grand Haven
Grand Ledge
Grand Rapids
Grandville
Grant*
Grass Lake*
Grayling (P)
Greenville
Grosse Pt. Farms
Grosse Pt. Park
Grosse Pt. Shores
Hamtramck
Hancock
Hanover
Harbor Beach
Harbor Springs
Harrietta*
Harrison
Harrisville*
Hart
Hartford
Hastings
Hersey*
Highland Park
Hillman (P)
Hillsdale
Holland
Holly
Homer
Honor*
Houghton
Howard City
Howell
Hubbell
Hudson
Imlay City
Ionia
Iron Mountain (P)
Iron River
Ironwood (P)
Ishpeming
Ithaca
Jackson
Jonesville
Kalamazoo
Kalkaska
Kent City*
Kinde*
Kingsley
Kingston
Laingsburg*
Lake City*
Lake Odessa
Lake View*
L'Anse
Lansing
Lapeer
Laurium (P)
Lawrence
Lawton
Leonard*
Leroy*
Leslie
Lexington
Lincoln*
Linden*
Litchfield*
Lowell (P)
Ludington
Luther*
Lyons
Mackinaw City*
Mackinac Island
Mancelona
Manchester
Manistee
Manistique
Manton
Maple Rapids*
Marcellus
Marine City
Marlborough*
Marlette
Marquette
Marshall
Mason
Maybee*
Mayville
McBride*
Mecosta*
Melvin*
Memphis*
Mendon*
Menominee
Mesick
Metamora*
Middleville*
Mikado*
Milan
Milford
Millersburg*
Millington
Minden City*
Monroe (P)
Montague
Montgomery*
Montrose*
Morenci
Morley*
Morrice*
Mt. Clemens
Mt. Morris*
Mt. Pleasant
Muir*
Mulliken*
Munising
Muskegon
Muskegon Heights
Nashville
Negaunee
Newaygo
New Baltimore
Newberry
New Buffalo*
New Haven*
Niles (P and M)
North Adams*
North Branch*
North Muskegon
Northport*
Northville
Norway
Oakley*
Oakwood
Olivet
Omer*
Onaway
Onekama*
Onsted*
Ontonagon
Orion
Ortonville*
Oscoda**
Otisville*
Otter Lake*
Ovid
Owendale*
Owosso
Oxford
Parma*
Paw Paw
Peck*
Pellston
Pentwater
Perrinton*
Perry
Petersburg*
Petoskey
Pewamo*
Pierson*
Pigeon
Pinckney*
Pinconning (P)
Plainwell
Plymouth
Pontiac
Port Austin
Port Hope*
Port Huron
Portland

TABLE NO. 1.—*Concluded.*

Port Sanilac*
Posen*
Potterville*
Quincy
Reading
Reed City
Reese*
Richland*
Richmond
River Rouge
Rochester
Rockford
Rogers*
Romeo
Roscommon
Rose City*
Royal Oak
Saginaw
Saline
Sand Lake*
Sandusky
Saranac
Saugatuck
Sault Ste. Marie
Schoolcraft
Scottville
Sebewaing*
Shepherd
Sheridan
Sherman*
Sherwood*
South Haven
South Lyon*
South Range
Sparta (P)
Spring Lake
Springport*
Stambaugh
Standish***
Stanton
Stanwood*
St. Charles
St. Clair
St. Clair Heights
Stephenson*
Stevensville*
St. Ignace
St. Johns
St. Joseph
St. Louis
Sturgis
Sunfield*
Suttons Bay
Tawas City
Tecumseh
Tekonsha*
Thompsonville
Three Oaks
Three Rivers
Tower*
Traverse City
Trenton
Tri-Mountain (P)
Tustin*
Twining
Ubly
Union City
Utica*
Vandalia*
Vassar
Vermontville*
Vernon*
Vicksburg
Wakefield
Waldron*
Walkerville*
Warren
Watervliet***
Wayland
Wayne
Webberville*
West Branch
Westlawn (Wayne County)
Westphalia*
Whitehall
White Pigeon*
Whittemore*
Wolverine*
Woodland*
Wyandotte
Yale
Ypsilanti
Zeeland

*No system.
**Not used for domestic purposes.
***Fire protection only.
§System contemplated.
(P) Privately owned.

Total..............413

No system..........154
Privately owned..... 25

TABLE NO. 2.—*Showing municipalities whose plans on Public Water supply have been accepted to July 1, 1916.*

Adrian
Alma
Almont
Ann Arbor
Athens
Bad Axe
Baltic
Bangor
Battle Creek
Bay City
Beaverton
Belding
Bellaire
Benton Harbor
Berrien Springs
Big Rapids
Birmingham
Boyne City
Buchanan
Bronson
Brown City
Cadillac
Caro
Carson City
Carsonville
Cass City
Cassopolis
Cedar Springs
Charlotte
Cheboygan
Chesaning
Clare
Coldwater
Columbiaville
Constantine
Coopersville
Corunna
Croswell
Crystal Falls
Dearborn
Decatur
Deckerville
Detroit
Dowagiac
Durand
East Grand Rapids
East Jordan
East Lansing
Eaton Rapids
Ecorse
Edmore
Elk Rapids
Empire
Escanaba
Essexville
Farmington
Farwell
Flint
Flushing
Ford
Fowlerville
Frankfort
Fremont
Gagetown
Galesburg
Gaylord
Gladstone
Grand Ledge
Grand Rapids
Grandville
Grayling
Greenville
Grosse Pt. Farms
Grosse Pt. Park
Grosse Pt. Shores
Hamtramck
Hancock
Hanover
Harbor Beach
Harbor Springs
Harrison
Hart
Hartford
Highland Park
Hillsdale
Holland
Holly
Homer
Houghton
Howard City
Howell
Hubbell
Hudson
Imlay City
Ionia
Iron Mountain
Iron River
Ishpeming
Ithaca
Jackson
Jonesville
Kalamazoo
Kalkaska
Kingsley
Kingston
Lake Odessa
Lawton
L'Anse
Lapeer
Laurium
Lawrence
Lowell
Ludington
Mackinac Island
Mancelona
Manchester
Manistee
Manistique
Manton
Marcellus
Marine City
Marlette
Marshall
Mason
Menominee
Mesick
Monroe
Morenci
Mt. Clemens
Munising
Muskegon
Muskegon Heights
Nashville
Negaunee
Newaygo
New Baltimore
Newberry
Niles
Northville
Norway
Oakwood
Olivet
Ontonagon
Orion
Ovid
Owosso
Oxford
Painesdale
Paw Paw
Pentwater
Perry
Pigeon
Pinconning
Plainwell
Plymouth
Pontiac
Port Huron
Portland
Quincy
Reading
Reed City
Richmond
River Rouge
Rochester
Rockford
Royal Oak
Romeo
Roscommon
Saginaw
Saline
Sandusky
Saranac
Saugatuck
Schoolcraft
Schoolcraft (Wayne Co.)
Scottville
South Haven
South Range
Sparta
Spring Lake
Stanton
St. Clair Heights
St. Ignace
St. Johns
St. Joseph
St. Louis
Suttons Bay
Tecumseh
Thompsonville
Three Oaks
Traverse City
Trenton
Tri-Mountain
Ubly
Union City
Vassar
Vicksburg
Wakefield
Watervliet
Wayne
West Branch
Westlawn (Wayne Co.)
Woodland
Wyandotte
Yale
Ypsilanti
Zeeland

Total...............207

TABLE NO. 3.—*Showing the municipalities that have fully complied with Act 98, P. A. 1913, with regard to Public Water supply to July 1, 1916.*

Addison*
Adrian (P)
Ahmeek*
Akron*
Alma
Almont
Ann Arbor
Applegate*
Armada
Ashley*
Athens
Au Gres*
Augusta*
Au Sable*
Bad Axe
Baldwin*
Baltic
Bangor
Baroda*
Barryton*
Battle Creek
Bay City
Bear Lake*
Beaverton
Belding
Bellaire (P)
Belleville*
Bellevue*
Benton Harbor
Berrien Springs
Big Rapids
Birmingham
Blissfield*
Bloomingdale*
Boardman*
Boyne City
Breedsville*
Brighton*
Brimley*
Brooklyn*
Britton*
Bronson*
Brown City
Buchanan
Buckley
Burlington*
Burr Oak*
Cadillac (P)
Caledonia*
Calumet Twp. (P)
Camden*
Carleton*
Caro (P)
Carson City
Carsonville
Caseville*
Casnovia*
Cass City
Cassopolis
Cedar Springs
Charlotte
Chesaning
Clare
Clayton*
Clifford*
Climax*
Coldwater
Colon*
Columbiaville (P)
Concord*
Constantine
Coopersville
Copemish*
Corunna
Croswell
Crystal Falls
Custer*
Daggett*
Dansville*
Davison*
Dearborn
Decatur
Deckerville*
Detroit
Dexter*
Dimondale*
Douglas*
Dowagiac
Dryden*
Dundee*
East Grand Rapids
Eagle*
East Jordan
East Lake (P)
East Lansing
Eaton Rapids
Eau Claire*
Edmore
Edwardsburg*
Elberta*
Elk Rapids (P)
Elsie*
Emmett*
Escanaba (P)
Essexville
Fairgrove*
Farmington
Farwell
Fife Lake*
Flint
Flushing
Ford (P)
Forestville*
Fountain*
Fowlerville
Frankenmuth*
Frankfort
Frazer*
Freeport*
Fremont
Gaines*
Galesburg
Galien*
Garden*
Gaylord
Gladstone
Gobleville*
Grand Ledge
Grand Rapids
Grandville
Grant*
Grass Lake*
Grayling (P)
Greenville
Grosse Pt. Farms
Grosse Pt. Park
Grosse Pt. Shores
Hancock
Hanover
Harbor Beach
Harbor Springs
Harrietta*
Harrison
Harrisville*
Hartford
Hersey*
Hart
Highland Park
Hillsdale
Holland
Holly
Homer
Honor*
Houghton
Howard City
Howell
Hubbell
Hudson
Imlay City
Ionia
Iron Mountain (P)
Iron River
Ishpeming
Ithaca
Jackson
Jonesville
Kalamazoo
Kalkaska
Kent City*
Kinde*
Kingsley
Kingston
Laingsburg*
Lake City*
Lake Odessa
Lakeview*
L'Anse
Lapeer
Laurium (P)
Lawrence
Lawton
Leonard*
Leroy*
Lincoln*
Linden*
Litchfield*
Lowell (P)
Ludington
Luther*
Lyon
Mackinaw City*
Mackinac Island
Mancelona
Manchester
Manistee
Manistique
Manton
Maple Rapids*
Marcellus
Marine City
Marlborough*
Marlette
Marshall
Mason
Maybee*
McBride*
Mecosta*
Melvin*
Memphis*
Mendon*
Menominee
Mesick
Metamora*
Middleville*
Mikado*
Millersburg*
Minden City*
Monroe (P)
Montgomery*
Montrose*
Morenci
Morley*
Morrice*
Mt. Clemens
Mt. Morris*
Muir*
Mulliken*
Munising
Muskegon
Muskegon Heights
Nashville
Negaunee
Newaygo
Newberry
New Buffalo*
New Baltimore
New Haven*
Niles (P and M)
North Adams*
North Branch*
Northport*
Northville
Norway
Oakley*
Oakwood
Olivet
Omer*
Onekama*
Onsted*
Ontonagon
Orion
Ortonville*
Oscoda
Otisville*
Otter Lake*
Ovid
Owendale*
Owosso
Oxford
Painesdale (P)
Parma*
Paw Paw
Peck*
Pentwater
Perrinton*
Perry
Petersburg*
Pewamo*
Pierson*
Pigeon
Pinckney*
Pinconning (P)
Plainwell
Plymouth
Pontiac
Port Hope*
Port Huron
Portland
Port Sanilac*
Posen*
Potterville*
Quincy
Reading
Reed City
Reese*
Richland*
Richmond
River Rouge
Rochester
Rockford
Rogers*
Romeo
Roscommon
Rose City*
Royal Oak
Saginaw
Sand Lake*
Saugatuck
Sandusky
Saranac
Schoolcraft
Scottville
Sebewaing*
Sherman*
Sherwood*
South Haven
South Lyon*
Sparta (P)
Spring Lake
Springport*
Stanton
Stanwood*
Stephenson*
Stevensville*
St. Clair Heights
St. Ignace
St. Johns
St. Joseph
St. Louis
Sunfield*

TABLE NO. 3.—*Concluded.*

Suttons Bay
Tawas City
Tekonsha*
Thompsonville
Three Oaks
Tower*
Traverse City
Tri-Mountain (P)
Tustin*
Twining
Ubly
Union City
Utica*
Vandalia*
Vassar
Vermontville*
Vernon*
Vicksburg
Wakefield
Waldron*
Walkerville*
Watervliet
Wayne
Webberville*
West Branch
Westphalia*
White Pigeon*
Whittemore*
Wolverine*
Woodland*
Wyandotte
Yale
Ypsilanti
Zeeland

Total................354

*No system.........153
(P) Privately owned...20

TABLE NO. 4.—*Showing municipalities whose question sheets on sewerage and sewage disposal have been accepted to July 1, 1916.*

Addison**
Adrian
Ahmeek
Akron
Alma
Almont
Alpena
Ann Arbor
Applegate**
Armada
Ashley*
Athens*
Au Gres*
Augusta*
Baldwin*
Baltic
Bancroft**
Bangor
Baraga
Baroda
Barryton*
Bay City
Bear Lake*
Beaverton
Belding
Bellaire*
Belleville
Bellevue
Benton Harbor
Benzonia*
Berrien Springs*
Bessemer
Big Rapids
Blissfield*
Bloomingdale
Boardman*
Boyne City
Boyne Falls*
Breckenridge*
Breedsville*
Brighton*
Brimley*
Britton*
Bronson**
Brooklyn**
Brown City
Buckley*
Burlington*
Burr Oak*
Byron**
Cadillac
Caledonia*
Camden*
Capac
Carleton*
Caro
Carson City
Carsonville
Caseville*
Cass City
Cassopolis*
Cedar Springs*
Central Lake*
Centreville*
Charlotte
Chesaning
Clare
Clarkston*
Clayton*
Clifford**
Climax*
Clio*
Coldwater
Coleman**
Coloma*
Colon*
Columbiaville*
Concord*
Constantine
Coopersville
Copemish*
Corunna
Croswell
Crystal Falls
Custer
Daggett*
Dansville*
Davison
Decatur*
Deckerville
Detour*
Detroit
Dexter*
Dimondale*
Douglas*
Dowagiac
Dryden*
Dundee
Durand
Eagle*
East Jordan
East Lake
East Lansing
Eaton Rapids
Eau Claire*
Ecorse
Edmore*
Edwardsburg*
Elberta*
Elkton*
Elsie*
Empire*
Escanaba
Essexville
Evart
Fairgrove**
Farmington
Farwell
Fennville*
Fife Lake*
Flint
Flushing†
Ford
Forestville*
Fountain*
Fowler*
Fowlerville**
Frankenmuth**
Frazer**
Freeport*
Fremont
Fruitport†
Gagetown
Gaines
Galesburg*
Galien*
Garden*
Gaylord*
Gladstone
Gobleville*
Grand Haven
Grand Ledge
Grand Rapids
Grandville***
Grant
Grass Lake†
Greenville
Grosse Pt. Farms
Grosse Pt. Shores†
Hamtramck
Hancock
Hanover*
Harrietta*
Harrison*
Harrisville**
Hartford*
Hersey*
Highland Park
Hillman
Hillsdale
Holland
Holly
Homer*
Honor*
Houghton
Howard City
Howell
Hubbell
Hudson
Imlay City
Ionia
Iron Mountain
Iron River
Ishpeming
Jonesville
Kalamazoo
Kalkaska*
Kent City*
Kingsley**
Kingston*
L'Anse*
Laingsburg*
Lake City*
Lake Odessa*
Lakeview*
Lansing
Lapeer
Laurium
Lawrence
Lawton
Leonard
Leroy*
Leslie
Lexington
Lincoln*
Linden*
Litchfield*
Lowell
Ludington
Luther*
Lyons**
Mackinaw City*
Mackinac Island
Mancelona*
Manistee
Manistique
Manton*
Maple Rapids*
Marcellus*
Marion†
Marine City
Marlborough*
Marlette
Marquette
Marshall
Maybee*
McBain*
McBride*
Mecosta*
Melvin*
Memphis*
Mendon
Menominee
Mesick*
Metamora*
Middleville*
Mikado*
Milford*
Millersburg**
Monroe
Montague*
Montgomery**
Montrose*
Morenci
Morley*
Morrice*
Mt. Clemens
Mt. Pleasant
Mulliken
Muir
Munising
Muskegon
Nashville
Negaunee
Newaygo
New Baltimore**
Newberry
New Buffalo**
New Haven
Niles
North Adams
North Branch
North Muskegon*
Northport†
Norway
Oakley*
Oakwood
Olivet*
Omer*
Onaway*
Onekama*
Onsted*
Ontonagon
Ortonville*
Oscoda†
Otisville*
Otsego
Otter Lake*
Ovid**
Owendale*
Owosso
Oxford*
Parma**
Painesdale†
Paw Paw
Peck*
Pellston*
Pentwater
Perrinton*
Perry*
Petersburg*
Petoskey
Pewamo*
Pierson*
Pigeon**
Pinckney*
Pinconning
Plainwell
Pontiac
Port Austin**
Port Hope
Port Huron
Portland
Port Sanilac*
Posen*
Potterville*
Quincy*
Reading
Redford*
Red Jacket
Reed City
Reese*
Richland*
Richmond**
River Rouge
Rochester
Rockford
Rogers*
Romeo
Roscommon*
Rose City
Royal Oak
Saginaw
Saline
Sand Lake
Sandusky
Saranac*
Saugatuck*
Schoolcraft*
Scottville

TABLE NO. 4.—*Concluded.*

Sebewaing**
Shelby*
Sheridan**
Sherman*
Sherwood*
South Haven
South Lyon**
Sparta
Spring Lake
Springport*
Standish
Stanton
Stanwood*
St. Clair
St. Clair Heights
St. Charles*
Stephenson*
Stevensville*

St. Johns
St. Joseph
St. Louis
Sturgis
Sunfield*
Suttons Bay
Tekonsha**
Tawas City*
Tecumseh
Thompsonville
Three Rivers
Three Oaks
Tower*
Traverse City
Trenton
Tri-Mountain (P)
Tustin*
Twining*

Ubly**
Union City
Utica*
Vandalia*
Vanderbilt*
Vassar
Vermontville*
Vernon*
Vicksburg*
Wakefield*
Waldron**
Walkerville**
Warren
Watervliet†
Wayland*
Wayne
Webberville
West Branch

Westphalia*
White Cloud*
Whitehall†
White Pigeon†
Whittemore*
Wolverine*
Woodland**
Wyandotte
Yale
Ypsilanti
Zeeland

*No system...........164
**Storm sewers only.....31
***System contemplated..1
†Private sewers.........11

Total.................384

TABLE NO. 5.—*Municipalities whose maps and plans for sewerage and sewage disposal have been accepted to July 1, 1916.*

Adrian
Ahmeek
Almont
Alpena
Armada
Baltic
Baroda
Battle Creek
Bay City
Beaverton
Belding
Big Rapids
Bloomingdale
Brown City
Caro
Carson City
Carsonville
Charlevoix
Charlotte
Cheboygan
Clare
Coldwater
Constantine
Coopersville
Corunna
Croswell
Crystal Falls
Davison
Deckerville
Detroit
Dowagiac
Dundee
Durand
East Jordan
East Lansing
Eaton Rapids
Ecorse

Escanaba
Essexville
Farmington
Farwell
Fenton
Flint
Ford
Fraser
Fremont
Gaines
Gladstone
Grand Haven
Grand Ledge
Grand Rapids
Grosse Pointe
Grosse Pt. Farms
Hamtramck
Hancock
Harbor Springs
Hart
Highland Park
Hillsdale
Holland
Houghton
Howard City
Howell
Hubbell
Hudson
Imlay City
Ionia
Iron River
Ishpeming
Jonesville
Kalamazoo
Lansing
Lapeer
Laurium

Lawrence
Lowell
Ludington
Manistee
Manistique
Marine City
Marlette
Marshall
Menominee
Monroe
Morenci
Mt. Clemens
Mt. Morris
Mt. Pleasant
Munising
Muskegon
Nashville
Negaunee
Newaygo
New Baltimore
Newberry
Niles
North Branch
Norway
Oakwood
Ontonagon
Otsego
Owosso
Painesdale
Paw Paw
Pentwater
Petoskey
Pigeon
Pinconning
Plainwell
Pontiac
Port Hope

Port Huron
Portland
Reading
Redford
Red Jacket
River Rouge
Rockford
Romeo
Rose City
Saline
Scottville
South Haven
Sparta
Spring Lake
Stanton
St. Clair Heights
St. Johns
St. Joseph
St. Louis
Sturgis
Tecumseh
Three Oaks
Three Rivers
Traverse City
Trenton
Tri-Mountain
Union City
Vassar
Vicksburg
Wayne
Webberville
Wyandotte
Yale
Ypsilanti
Zeeland

Total...............146

TABLE NO. 6.—*Showing municipalities that have fully complied with Act 98, P. A. 1913, with regard to sewerage and sewage disposal to July 1, 1916.*

Addison*
Adrian
Ahmeek
Akron*
Almont
Alpena
Applegate
Armada
Ashley*
Athens*
Au Gres*
Augusta*
Baldwin*
Baltic
Bancroft*
Baroda
Barryton*
Bay City
Bear Lake*
Beaverton
Belding
Bellaire*
Benzonia*
Berrien Springs*
Big Rapids
Blissfield*
Bloomingdale
Boardman*
Boyne Falls*
Breckenridge*
Breedsville*
Brighton*
Brimley*
Britton*
Bronson*
Brooklyn
Brown City
Buckley*
Burlington*
Burr Oak*
Byron*
Caledonia*
Camden*
Carleton*
Caro
Carson City
Carsonville
Caseville*
Cass City*
Cassopolis*
Cedar Springs*
Central Lake
Centreville*
Charlevoix
Charlotte
Clare
Clarkston*
Clayton*
Clifford*
Climax*
Clio*
Coldwater
Coleman*
Coloma*
Colon*
Columbiaville*
Concord*
Constantine
Coopersville
Copemish*
Corunna
Croswell
Crystal Falls
Daggett*
Dansville*
Davison
Decatur*
Deckerville
Detour*
Detroit
Dexter*
Dimondale*
Douglas*
Dowagiac
Dryden*
Dundee
Durand
Eagle*
East Jordan
East Lansing
Eaton Rapids
Eau Claire*
Ecorse
Edmore*
Edwardsburg*
Elberta*
Elkton*
Elsie*
Empire*
Escanaba
Essexville
Fairgrove*
Farmington
Farwell
Fennville*
Fife Lake*
Flint
Flushing
Ford
Forestville*
Fountain*
Fowler*
Fowlerville*
Frankenmuth*
Frazer*
Freeport*
Fremont
Fruitport
Gagetown*
Gaines
Galesburg*
Galien*
Garden*
Gaylord*
Gladstone
Gobleville*
Grand Haven
Grand Ledge
Grand Rapids
Grandville*
Grant*
Grass Lake*
Grosse Pt. Farms
Grosse Pt. Shores
Hamtramck
Hancock
Hanover*
Harrietta*
Harrison*
Harrisville*
Hartford*
Hersey*
Highland Park
Hillsdale
Holland
Homer*
Honor*
Houghton
Howard City
Howell
Hubbell
Imlay City
Ionia
Iron River
Ishpeming
Jonesville
Kalamazoo
Kalkaska*
Kent City*
Kingsley*
Kingston*
Laingsburg*
Lake Odessa*
Lakeview*
Lansing
Lapeer
Laurium
Lawrence
L'Anse*
Leroy*
Lincoln*
Linden*
Litchfield*
Lowell
Ludington
Luther*
Lyons*
Mackinaw City*
Mackinac Island
Mancelona*
Manistee
Manistique
Manton*
Maple Rapids*
Marcellus*
Marine City
Marion
Marlborough*
Marlette
Marshall
Maybee*
McBain
McBride*
Mecosta*
Melvin*
Memphis*
Mendon*
Menominee
Mesick*
Metamora*
Middleville*
Mikado*
Milford*
Millersburg*
Monroe
Montague*
Montgomery*
Montrose*
Morley*
Morrice*
Muir*
Mulliken*
Muskegon
Nashville
Negaunee
Newaygo
New Baltimore
Newberry
New Buffalo*
North Branch
North Muskegon*
Northport*
Norway
Oakley*
Oakwood
Olivet*
Onaway*
Onsted*
Ontonagon
Ortonville*
Oscoda
Otsego
Otter Lake*
Ovid*
Owendale*
Owosso
Oxford*
Parma*
Paw Paw
Peck*
Pellston*
Pentwater
Perrinton*
Perry*
Petersburg*
Petoskey
Pewamo*
Pierson*
Pigeon
Pinckney*
Pinconning
Plainwell
Pontiac
Port Austin*
Port Hope
Port Huron
Portland
Port Sanilac*
Posen*
Potterville*
Quincy*
Reading
Redford
Red Jacket
Reese*
Richland*
River Rouge
Rockford
Rogers*
Romeo
Roscommon*
Rose City
Saline
Sand Lake*
Saranac*
Saugatuck*
Schoolcraft*
Scottville
Sebewaing*
Shelby*
Sherman*
Sheridan*
Sherwood*
South Haven
South Lyon*
Sparta
Spring Lake
Springport*
Stanton
Stanwood*
St. Charles*
St. Clair Heights
St. Johns
St. Joseph
St. Louis
Stephenson*
Stevensville*
Sturgis
Sunfield*
Suttons Bay*
Tawas City*
Tecumseh
Tekonsha*
Three Oaks
Tower*
Traverse City
Trenton
Tri-Mountain
Tustin*
Twining*
Ubly*
Union City
Utica*
Vandalia*
Vanderbilt*
Vassar
Vermontville*
Vernon*
Vicksburg
Wakefield*

TABLE NO. 6.—*Concluded.*

Waldron*
Walkerville*
Watervliet*
Wayland*
Wayne
Webberville
Westphalia*
White Cloud
White Pigeon*
Whittemore*
Wolverine*
Wyandotte
Yale
Ypsilanti
Zeeland

*No system.........194
Total...............335

TABLE NO. 7.—*Municipalities using Hypochlorite or Liquid Chlorine for treatment of their Public Water supply to July 1, 1916.*

HYPOCHLORITE.

Dearborn*
Escanaba*
Gladstone
Grand Rapids*
Ludington
Marine City..
Menominee
Negaunee
Norway
Port Huron
South Haven
St. Clair
Wyandotte

Total.................13
*Adjunct to filtration.

LIQUID CHLORINE.

Adrian
Alpena
Ann Arbor
Battle Creek
Bay City
Detroit
East Grand Rapids
Flint*
Grand Rapids Hydraulic Co.
Highland Park
Grosse Pointe Farms
Monroe
St. Joseph
Traverse City
Total.................14

Municipalities having filtration systems for purifying their public water supply to July 1, 1916:

Adrian
Dearborn
Escanaba
Flint
Grand Rapids
Ironwood
Total.................6

TABLE NO. 8.—*Plans and specifications for State Buildings recommended for approval by the State Sanitary Engineer to July 1, 1916.*

July 8, 1915—Michigan School for the Blind, Lansing. Administration building and dormitory.
July 9, 1915—Newberry State Hospital—Cottage "H".
July 9, 1915—Newberry State Hospital—Addition to tubercular building.
August 11, 1915—Newberry State Hospital—Nurses' home.
August 11, 1915—State Hospital, Kalamazoo—Industrial building.
Sept. 1, 1915—Michigan State Prison, Jackson—New dormitory.
Oct. 4, 1915—Kalamazoo State Hospital—Nurses' home.
Oct. 9, 1915—Traverse City State Hospital—Carpenter shop.
Oct. 14, 1915—Wahjamega, Epileptic Farm Colony—Cottage for female patients.
Oct. 14, 1915—Wahjamega, Epileptic Farm Colony—Cottage for male patients.
March 28, 1916—Flint, Michigan School for the Deaf—Manual training school.
June 1, 1916—Wahjamega, Michigan Farm Colony for Epileptics—Colony building No. 5.

TABLE NO. 9.—*Sanitary Inspections and consultations to July 1, 1916.*

Location.	Date.	Subject.	Engineer.
Adrian	Dec. 22	Water supply investigation	J. W. Follin.
Adrian	Mar. 7	Water supply and laboratory control of filtration plant	J. W. Follin.
Alanson	May 27	Submission of question sheets	D W. Bingham.
Alaska	July 2	Public address	E. D. Rich.
Albany, N. Y.	Aug. 27	Inspection of water filtration	E. D. Rich.
Albion	June 30	Public water supply	F. G. Legg.
Algonac	Apr. 6	Submission of plans and inspection of water supply	J. W. Follin.
Allegan	Feb. 23	Plans and inspection of sewerage	J. W. Follin.
Alma	Oct. 7	Filing of plans	E. D. Rich.
Alma	Oct. 9	Public address on sanitation, good health week	E. D. Rich.
Alma	Oct. 9	Conference with Prof. Hoad at Lansing on Alma sewers	E. D. Rich.
Almont	Oct. 21	Sewage disposal	E. D. Rich.
Almont	Mar. 9	Submission of maps	D. W. Bingham.
Alpena	Dec. 29	Water supply	D. W. Bingham.
Alpena	Feb. 14	Water supply	J. W. Follin.
Alpena	May 25	Water supply purification	D. W. Bingham.
Angling	Dec. 10	Typhoid investigation at lumber camp	D. W. Bingham.
Ann Arbor	Oct. 27	Tests on jointing compound	F. G. Legg.
Ann Arbor	Nov. 6	Tests on jointing material	F. G. Legg.
Ann Arbor	Dec. 21	Water supply investigation	J. W. Follin.
Ann Arbor	Jan. 31	Inspection of sanitary experimental station at University of Michigan	J. W. Follin.
Ann Arbor	Mar. 8	River Rouge sanitary survey	J. W. Follin.
Ann Arbor	Apr. 6	Conference on water plans	E. D. Rich.
Ann Arbor	Apr. 15	Inspection of sewage experimental station	E. D. Rich.
Ann Arbor	Apr. 15	Visit to sanitary experimental station	J. W. Follin.
Ann Arbor	May 20	River Rouge sanitary survey	J. W. Follin.
Ann Arbor	May 29	Grand River sanitary survey	J. W. Follin.
Ann Arbor	June 6	Grand River sanitary survey	J. W. Follin.
Applegate	Apr. 11	Submission of question sheets	D. W. Bingham.
Atlanta	May 22	General conference	D. W. Bingham.
Bad Axe	Mar. 28	Conference at Lansing on Bad Axe sewerage	E. D. Rich.
Baraga	June 6	Submission of plans	D. W. Bingham.
Baroda	Mar. 17	Submission of maps	D. W. Bingham.
Batavia, N. Y.	Sept. 9	Inspection of sewage disposal	E. D. Rich.
Battle Creek	Dec. 10	Water supply	D. W. Bingham.
Bay City	Apr. 16	Talk to Common Council on water supply	J. W. Follin.
Bay View	Aug. 3	Sewage disposal	D. W. Bingham.
Bellaire	May 28	Sewage disposal (at Fisherman's Paradise)	D. W. Bingham.
Bellaire	May 29	Submission of plans and sewerage (at Fisherman's Paradise)	D. W. Bingham.
Bellaire	Aug. 18	Sewage disposal	D. W. Bingham.
Big Rapids	July 26	Typhoid investigation at Mercy Hospital	J. W. Follin.
Bay City	Mar. 20, 21, 22	Water supply and laboratory control of sterilization	J. W. Follin.
Bay City	Mar. 27, 28, 29	Water supply	J. W. Follin.
Bay View	May 31	Sewage disposal	D. W. Bingham.
Belleville	Mar. 28	Sewer maps	D. W. Bingham.
Benton Harbor	Sept. 8, 9	Sewage and garbage disposal at "House of David"	F. G. Legg.
Benton Harbor	Mar. 30	Sewage and garbage disposal at "House of David"	F. G. Legg.
Berrien Springs	Dec. 8	Sewage disposal	F. G. Legg.
Berrien Springs	Mar. 17	Conference with W. J. Cleary on sewerage	D. W. Bingham.
Berrien Springs	Mar. 30	Inspection of proposed sewerage	F. G. Legg.
Bessemer	June 8	Submission of plans	D. W. Bingham.
Birmingham	Aug. 13	Sewerage and sewage disposal	E. D. Rich.
Birmingham	Apr. 13	River Rouge survey	J. W. Follin.
Boyne City	Sept. 10	Sewerage	D. W. Bingham.
Boyne City	May 22	Sewerage and submission of plans	D. W. Bingham.
Breckenridge	Aug. 3	Creamery nuisance	D. W. Bingham.
Brighton	Feb. 14	Ice inspection	D. W. Bingham.

TABLE NO. 9.—*Continued.*

Location.	Date.	Subject.	Engineer.
Brimley	June 1	Submission of question sheets	D. W. Bingham.
Bronson	Dec. 30	Water supply and sewage disposal	F. G. Legg.
Bronson	Jan. 1	Water supply	F. G. Legg.
Brooklyn	Mar. 20	Water and sewer question sheets	D. W. Bingham.
Brown City	Dec. 8	Sewerage	D. W. Bingham.
Brown City	Jan. 1	Conference with C. W. Hubbell at Detroit on Brown City sewerage and sewage disposal	D. W. Bingham.
Brown City	Feb. 17	Conference with Brown City engineer on sewerage	F. G. Legg.
Brown City	Apr. 10	Submission of plans and sewage situation	D. W. Bingham.
Brown City	June 30	Sewerage	E. D. Rich.
Buchanan	Mar. 16	Submission of maps	D. W. Bingham.
Buchanan	June 2	Sewerage	F. G. Legg.
Burlington	June 3	Water supply and sewerage	F. G. Legg.
Cadillac	Aug. 21	Conference on water purification	E. D. Rich.
Cadillac	Sept. 9	Conference with Prof. Hoad on Midland County Sanitarium	D. W. Bingham.
Cadillac	Sept. 17	Conference on water supply	E. D. Rich.
Cadillac	Sept. 29	Conference on water supply	E. D. Rich.
Cadillac	Apr. 27	Water supply and submission of plans	D. W. Bingham.
Capac	Apr. 14	Submission of plans	D. W. Bingham.
Carleton	Mar. 24	Water and sewer question sheets	D. W. Bingham.
Caro	Apr. 14	Conference with Caro Water Co. on submission of maps	D. W. Bingham.
Cass City	Mar. 22	Conference with Mr. Pearson, of Saginaw, on schoolhouse sewage disposal	D. W. Bingham.
Cass City	Aug. 4	Sewage disposal	D. W. Bingham.
Cassopolis	Sept. 9	Water supply and schoolhouse sewage disposal	F. G. Legg.
Central Lake	Aug. 28	Sewage disposal	D. W. Bingham.
Charlevoix	May 30	Submission of plans and sewerage	D. W. Bingham.
Cheboygan	Dec. 28	Water supply and sewerage	D. W. Bingham.
Cheboygan	May 26	Submission of question sheets	D. W. Bingham.
Chelsea	Mar. 23	Submission of maps	D. W. Bingham.
Chelsea	June 29	Sewerage and sewage disposal	J. W. Follin.
Chicago, Ill	Sept. 22	Inspection of Jennings screen and sewage disposal experiments of sanitary district	J. W. Follin.
Chicago, Ill	Nov. 4	Inspection of sewage disposal at stock yards	E. D. Rich.
Chicago, Ill	Feb. 25	Inspection of Armour sewage disposal plant	J. W. Follin.
Clark Lake	Aug. 6	Sewage disposal at resort	F. G. Legg.
Clinton	Mar. 22	Submission of water and sewer question sheets	D. W. Bingham.
Clio	Apr. 18	Submission of question sheets	D. W. Bingham.
Clio	Apr. 19	General sanitation	D. W. Bingham.
Coldwater	Oct. 16	Sewage disposal	F. G. Legg.
Coldwater	Dec. 27	Water supply and sewage disposal	F. G. Legg.
Coldwater	Mar. 11	Sewage disposal	F. G. Legg.
Coldwater	May 27	Sewerage	F. G. Legg.
Coloma	Dec. 7	Sewage disposal	F. G. Legg.
Comstock	July 24	Sewage disposal for schoolhouse	J. W. Follin.
Coloma	Sept. 21	Sewage disposal	J. W. Follin.
Coloma	Nov. 16	Sewerage	F. G. Legg.
Conklin	Sept. 20	Sewage disposal—private	J. W. Follin.
Constantine	May 10	New water supply	D. W. Bingham.
Coopersville	Aug. 5	Sewage and trade waste disposal	J. W. Follin.
Custer	May 3	General sanitation	D. W. Bingham.
Cutlerville	Oct. 1	Sewage disposal at the Christian Psychopathic Hospital	J. W. Follin.
Decatur	Mar. 18	Submission of maps	D. W. Bingham.
Dearborn	Aug. 11	Operation of Ford filter plant	J. W. Follin.
Dearborn	Aug. 18	Operation of Ford filter plant	J. W. Follin.
Dearborn	Oct. 11	Sewage disposal at Ford Tractor Plant	D. W. Bingham.
Dearborn	Dec. 21	Water supply investigation	J. W. Follin.
Dearborn	Jan. 26	Water supply maps	D. W. Bingham.
Dearborn	Feb. 2	Conference with Fred Gregory on water and sewerage of Dearborn	J. W. Follin.
Dearborn	Mar. 18	Ford filter plant	J. W. Follin.
Dearborn	Mar. 18	Sewage disposal, St. Joseph Retreat	J. W. Follin.
Dearborn	Apr. 13	River Rouge survey	J. W. Follin.
Dearborn	Apr. 19	Sewerage	J. W. Follin.

TABLE NO. 9.—*Continued.*

Location.	Date.	Subject.	Engineer.
Dearborn	Apr. 19	Public address before Common Council on proposed sewerage	E. D. Rich.
Dearborn	June 23,24	River Rouge sanitary survey	J. W. Follin.
Deckerville	Apr. 12	Submission of plans	D. W. Bingham.
Delta	Sept. 3	Slaughter house nuisance	F. G. Legg.
Detroit	July 8	Garbage nuisance	F. G. Legg.
Detroit	July 21	Conference on sewage disposal	E. D. Rich.
Detroit	Nov. 24	Sewage disposal for sub-division	D. W. Bingham.
Detroit	Dec. 20	Special meeting of State Board of Health	J. W. Follin.
Detroit	Jan. 28	Sewerage for recently annexed territory	D. W. Bingham.
Detroit	Jan. 29	Conference with C. Johnson, village president of Dearborn, on re-submission of water and sewer plans	D. W. Bingham.
Detroit	Jan. 21	Conference with Mason L. Brown on submission of water and sewer plans	D. W. Bingham.
Detroit	Jan. 22	Ice inspection	D. W. Bingham.
Detroit	Feb. 2	Inspection of Detroit liquid chlorine sterilization plant and Water Board laboratory	J. W. Follin.
Detroit	Feb. 10,11, 12,15	Sanitary survey, river points	J. W. Follin.
Detroit	Feb. 3	Sanitary survey prospectus	J. W. Follin.
Detroit	Feb. 5	Conference with Emil Nerlinger on sewerage and sewage disposal in sub-divisions	D. W. Bingham.
Detroit	Feb. 11	Ice inspection	D. W. Bingham.
Detroit	Feb. 21	Conference with Jos. Campeau on submission of water and sewer plans	D. W. Bingham.
Detroit	Feb. 21	Conference with T. A. Leison and C. W. Hubbell on the automatic control of liquid chlorine apparatus	D. W. Bingham.
Detroit	March 1	Conference with Detroit Water Commission on submission of maps	D. W. Bingham.
Detroit	Mar. 1,2,3,4, and 6	Sanitary survey of down river points	J. W. Follin.
Detroit	Apr. 6–7	Sanitary survey down river points	J. W. Follin.
Detroit	Apr. 20,21	Sanitary survey down river points	J. W. Follin.
Detroit	Apr. 24,25	Sanitary survey down river points	J. W. Follin.
Detroit	Apr. 26	River Rouge sanitary survey	J. W. Follin.
Detroit	Apr. 28,29	Sanitary survey down river points	J. W. Follin.
Detroit	May 1,2,3,4, 5	Sanitary survey down river points	J. W. Follin.
Detroit	May 8,9,10	Sanitary survey down river points	J. W. Follin.
Detroit	May 12	Sanitary survey down river points	J. W. Follin.
Detroit	May 15	Sewage disposal at St. Francis school for boys.	J. W. Follin.
Detroit	May 18	Sewage disposal at Deaf and Dumb school	J. W. Follin.
Detroit	May 22	Conference with Albert Kahn on sewage disposal at St. Francis School for boys	J. W. Follin.
Detroit	June 3	Conference with Mr. Haas in regard to sewerage for sub-division	E. D. Rich.
Detroit	June 16	Convention of American Medical Association.	E. D. Rich.
Detroit	June 26,27	Meeting of International Joint Commission on Pollution of Boundary Waters	E. D. Rich.
Detroit	June 26,27	Same	J. W. Follin.
Detroit	Apr. 6	Sewerage	F. G. Legg.
Drayton Plains	Feb. 17	Ice inspection	D. W. Bingham.
Dundee	June 29	Water supply and sewage disposal	F. G. Legg.
Durand	Mar. 7	Submission of maps	D. W. Bingham.
Durand	Apr. 18	Conference at Lansing with Mr. Cade	F. G. Legg.
Durand	May 4	Conference at Lansing with Mr. Cade in regard to Durand	F. G. Legg.
East Lansing	Aug. 24	Sewage disposal—private	D. W. Bingham.
East Lansing	Feb. 8	Public address at M. A. C	E. D. Rich.
East Lansing	Feb. 15	Public address at M. A. C	E. D. Rich.
East Gd. Rapids.	Nov. 17	Sewage disposal	F. G. Legg.
East Gd. Rapids.	Dec. 22	Water supply	D. W. Bingham.
East Gd. Rapids.	May 30	Inspection of sewage disposal plant	J. W. Follin.
East Lake	May 2	Submission of question sheets	D. W. Bingham.
East Lake	May 2	Conference with manager of the R. G. Peters Salt & Lumber Co. regarding the water supply furnished East Lake	D. W. Bingham.

TABLE NO. 9.—*Continued.*

Location.	Date.	Subject.	Engineer.
Eastwood, N. Y.	Sept. 6	Inspection of sewage disposal	E. D. Rich.
Eaton Rapids	Apr. 13	Drainage	F. G. Legg.
Eau Claire	Mar. 17	Sewer and water question sheets	D. W. Bingham.
Ecorse	Feb. 12	Ice inspection	D. W. Bingham.
Ecorse	Feb. 22	Ice inspection	D. W. Bingham.
Ecorse	Feb. 28	Conference with I. Salliotte, Village Attorney, on submission of Ecorse maps	D. W. Bingham.
Ecorse	June 9	Consultation with Russell Murdoch, of Detroit, on Ecorse sewer maps and sub-division near Detroit	D. W. Bingham.
Eloise	Apr. 14	River Rouge sanitary survey	J. W. Follin.
Eloise	June 23,24	River Rouge sanitary survey	J. W. Follin.
Elk Rapids	May 29	Submission of plans	D. W. Bingham.
Empire	Apr. 29	Submission of plans	D. W. Bingham.
Escanaba	July 1	Inspection of filtration plant	E. D. Rich.
Escanaba	July 1	Public address	E. D. Rich.
Escanaba	Dec. 14	Water supply investigation	J. W. Follin.
Escanaba	June 3	North Mich. Water Co.'s water supply	D. W. Bingham.
Escanaba	June 3	Sewerage and sewage disposal and typhoid investigation	D. W. Bingham.
Essexville	May 19	Sewerage	E. L. Waterman.
Evart	May 20	Submission of plans	D. W. Bingham.
Fair Haven Mills	Feb. 16	Ice inspection	D. W. Bingham.
Farmington	Apr. 12	River Rouge sanitary survey	J. W. Follin.
Fennville	July 2	Creamery nuisance	D. W. Bingham.
Fenton	Aug. 6	Sewerage	D. W. Bingham.
Fenton	Mar. 8	Submission of maps	D. W. Bingham.
Fenwick	Aug. 3	Creamery nuisance	D. W. Bingham.
Flint	Nov. 23	Inspection of housing conditions	D. W. Bingham.
Flint	Nov. 29	Water supply	D. W. Bingham.
Flint	Feb. 2	Typhoid investigation	J. W. Follin.
Flint	Feb. 2	Typhoid investigation	E. D. Rich.
Flint	Feb. 5,6	Typhoid investigation	J. W. Follin.
Flint	Mar. 23,24	Typhoid investigation	J. W. Follin.
Flushing	Apr. 19	Submission of plans	D. W. Bingham.
Ford	Oct. 23	Sewage disposal	D. W. Bingham.
Ford	Nov. 6	Sewage disposal	D. W. Bingham.
Ford	Feb. 2	Typhoid investigation	E. D. Rich.
Ford	Feb. 3	Sanitary survey prospectus	J. W. Follin.
Ford	Feb. 9 to Mar. 31	Sanitary survey	E. L. Waterman.
Ford	Apr. 1 to 14	Sanitary survey	E. L. Waterman.
Ford Republic	Jan. 1	Conference with C. W. Hubber, of Detroit, on Ford Republic sewerage and sewage disposal	E. D. Rich.
Fowler	Apr. 6	Submission of maps	D. W. Bingham.
Fowlerville	May 2	Inspection of sewerage system	F. G. Legg.
Fowlerville	June 19	Conference at Lansing on sewerage for Fowlerville	E. D. Rich.
Frankfort	Apr. 29	Submission of plans	D. W. Bingham.
Fraser	Aug. 5	Drainage	D. W. Bingham.
Fremont	July 1	Canning waste treatment at Fremont Canning Co	J. W. Follin.
Fremont	July 10	Installation of experimental plant for canning wastes	J. W. Follin.
Fremont	July 14	Experimental plant—Fremont Canning Co	J. W. Follin.
Fremont	July 17	Experimental plant—Fremont Canning Co	J. W. Follin.
Fremont	July 23	Experimental plant—Fremont Canning Co	J. W. Follin.
Fremont	Aug. 4	Experimental plant—Fremont Canning Co	J. W. Follin.
Fremont	Aug. 12,13	Experimental plant—Fremont Canning Co	J. W. Follin.
Fremont	Aug. 20	Experimental plant—Fremont Canning Co	J. W. Follin.
Fremont	Aug. 20	Inspection of sewage disposal experiments	E. D. Rich.
Fremont	Aug. 27	Experimental plant—Fremont Canning Co	J. W. Follin.
Fremont	Sept. 1	Experimental plant—Fremont Canning Co	J. W. Follin.
Fremont	Sept. 13	Experimental plant—Fremont Canning Co	J. W. Follin.

TABLE NO. 9.—*Continued.*

Location.	Date.	Subject.	Engineer.
Fremont	Oct. 8,9	Canning wastes disposal	J. W. Follin.
Fremont	Oct. 20	Canning wastes disposal	J. W. Follin.
Fremont	Oct. 23	Conference with Prof. Hoad at Ann Arbor on canning wastes disposal at Fremont	J. W. Follin.
Fremont	Nov. 2	Canning wastes disposal	J. W. Follin.
Fremont	Dec. 7	Canning wastes disposal	J. W. Follin.
Fremont	Feb. 22	Consultation with J. R. Rumsey on Fremont water supply	J. W. Follin.
Fremont	Mar. 16	Sewage disposal	E. D. Rich.
Gagetown	Apr. 13	Submission of plans	D. W. Bingham.
Gaines	Mar. 8	Submission of maps	D. W. Bingham.
Galesburg	Mar. 15	Submission of maps	D. W. Bingham.
Gaylord	Sept. 15	Conference with Mr. Pearson regarding school house sewerage	F. G. Legg.
Geneva, Ill	Sept. 22	Inspection of sewage disposal	E. D. Rich.
Gladstone	Dec. 14	Water supply investigation	J. W. Follin.
Gladwin	Nov. 1	Sewerage	D. W. Bingham.
Gloversville, N.Y	Aug. 30	Inspection of sewage disposal	E. D. Rich.
Grandville	Nov. 17	School house sewage disposal	F. G. Legg.
Grandville	Apr. 7	School house sewage disposal	D. W. Bingham.
Grant	Feb. 21	Drainage project	J. W. Follin.
Grass Lake	Feb. 9	Drainage project	F. G. Legg.
Gratiot Twp. (Wayne Co.)	Aug. 13	Drainage project	D. W. Bingham.
Grayling	July 15	Sewage disposal at Dupont Powder Co	J. W. Follin.
Grayling	May 23	Submission of plans	D. W. Bingham.
Greenfield Twp. (Wayne Co.)	Mar. 30	Conference with H. M. Stark on sewage disposal for St. Francis Home for Boys	D. W. Bingham.
Gregorieville	June 7	Submission of plans	D. W. Bingham.
Grand Rapids	July 2,3	Tannery wastes experimental work	J. W. Follin.
Grand Rapids	July 12	Tannery wastes experimental work	J. W. Follin.
Grand Rapids	July 22	Tannery wastes experimental work	J. W. Follin.
Grand Rapids	Aug. 14	Tannery wastes experimental work	J. W. Follin.
Grand Rapids	Aug. 21	Tannery wastes experimental work	J. W. Follin.
Grand Rapids	Aug. 28,29	Tannery wastes experimental work	J. W. Follin.
Grand Rapids	Sept. 2,3	Tannery wastes experimental work	J. W. Follin.
Grand Rapids	Sept. 17,18,19	Tannery wastes experimental work	J. W. Follin.
Grand Rapids	Oct. 7	Tannery wastes experimental work	J. W. Follin.
Grand Rapids	Oct. 11	Sewage disposal at Kent County poor farm	J. W. Follin.
Grand Rapids	Oct. 22	Sewage disposal at Kent County poor farm	J. W. Follin.
Grand Rapids	Nov. 3	Tannery wastes experimental work	J. W. Follin.
Grand Rapids	Nov. 24	Public address on "Garbage Disposal" before Builders' & Traders' Exchange	J. W. Follin.
Grand Rapids	Nov. 29	Water filtration	J. W. Follin.
Grand Rapids	Dec. 7	Conference with Mr. Cutcheon, of the Board of Public Works, regarding water filtration monthly reports	J. W. Follin.
Grand Rapids	Dec. 8–10	Tannery wastes experimental work	J. W. Follin.
Grand Rapids	Dec. 22	Conference with Jas. Rumsey on sewage disposal	F. G. Legg.
Grand Rapids	Dec. 22	Water supply of Grand Rapids Hydraulic Co.	D. W. Bingham.
Grand Rapids	Jan. 18	Public address before Michigan Engineering Society	E. D. Rich.
Grand Rapids	Jan. 18–20	Meeting of Michigan Engineering Society	J. W. Follin.
Grand Rapids	Jan. 18	Meeting of Michigan Engineering Society	D. W. Bingham.
Grand Rapids	Feb. 22	Water supply of Grand Rapids Hydraulic Co.	J. W. Follin.
Grand Rapids	Mar. 17	Experimental work on tannery wastes	J. W. Follin.
Grand Rapids	Apr. 3	Experimental work on tannery wastes	J. W. Follin.
Grand Rapids	Apr. 7	Conference with Jas. Fitzpatrick on submission of Grand Rapids Hydraulic Company's plans	D. W. Bingham.
Grand Rapids	May 16,17,18	Water supply	E. L. Waterman.
Grand Rapids	May 24	Meeting Grand Rapids Engineering Society	J. W. Follin.

TABLE NO. 9.—*Continued.*

Location.	Date.	Subject.	Engineer.
Grand Rapids	May 24	Public address before Engineering Club	E. D. Rich.
Grand Rapids	May 29	Experimental work on tannery wastes at Wallin Leather Company and inspection of sewage disposal plant at the Kent County poor farm	J. W. Follin.
Grand Rapids	June 1,3,4,5.	Typhoid fever investigation	J. W. Follin.
Grand Rapids	June 10,12, 13,14,15.	Typhoid fever investigation	J. W. Follin.
Grosse Pointe	Mar. 1	Submission of plans	D. W. Bingham.
Grosse Pt. Farms.	Jan. 31	Conference with Paul N. Deming, Village President, on submission of plans	D. W. Bingham.
Grosse Pt. Farms.	Feb. 28	Conference with J. W. Berne on submission of maps	D. W. Bingham.
Grosse Pt. Shores.	Mar. 1	Conference with Geo. Osius, Village President, on submission of maps	D. W. Bingham.
Grosse Pt. Twp.	Jan. 27	Conference at Detroit on DeBuch sewage disposal in Grosse Pt. Township	D. W. Bingham.
Hamtramck	Feb. 25	Submission of maps	D. W. Bingham.
Hamtramck	Feb. 28	Conference at Detroit with Geo. Jermone on submission of Hamtramck water and sewer maps	D. W. Bingham.
Hancock	June 5	Conference with Dr. Abrams on water and sewerage for the County Tuberculosis Sanatorium and Infirmary	D. W. Bingham.
Hanover	Mar. 20	Submission of maps	D. W. Bingham.
Harbor Springs	July 7	Sewage disposal	D. W. Bingham.
Harbor Springs	Mar. 24	Conference at Lansing with E. C. Christ on sewage disposal for Harbor Springs	D. W. Bingham.
Harbor Springs	May 31	Sewerage and sewage disposal	D. W. Bingham.
Hastings	Mar. 24	Conference at Lansing with E. C. Christ on sewage disposal for Hastings	F. G. Legg.
Hastings	June 1	Sewage disposal and maps	F. G. Legg.
Hemlock	Nov. 24	Proposed sewerage	F. G. Legg.
Highland Park	Dec. 21	Water supply	D. W. Bingham.
Hillman	May 25	Submission of plans	D. W. Bingham.
Hillsdale	Sept. 13	Inspection of sewer construction	F. G. Legg.
Hillsdale	Sept. 13	Inspection of newly installed sewage disposal plant at the County Infirmary	F. G. Legg.
Hillsdale	Oct. 19	Sewerage	F. G. Legg.
Hillsdale	Dec. 24	Sewerage and sewage disposal at County Farm.	F. G. Legg.
Hillsdale	Dec. 29	Sewerage and sewage disposal at County Farm.	F. G. Legg.
Hillsdale	Jan. 7	Conference at Lansing with the City Engineer of Hillsdale on sewerage	F. G. Legg.
Hillsdale	Feb. 29	Conference at Lansing on Hillsdale sewerage	F. G. Legg.
Hillsdale	May 11	Sewage for County Infirmary	F. G. Legg.
Hillsdale	June 28	Conference with Chas. Fox, of Hillsdale, at Lansing, on sewage disposal for County Infirmary	F. G. Legg.
Honor	Apr. 29	Submission of question sheets	D. W. Bingham.
Houghton	June 4	Sewage disposal for County Tuberculosis Sanatorium; water supply for Infirmary and Tuberculosis Sanatorium	D. W. Bingham.
Houghton	June 6	Water supply and sewerage for County Tuberculosis Sanatorium and Infirmary	D. W. Bingham.
Holton	July 1	Sewage disposal	D. W. Bingham.
Howell	Mar. 7	Submission of maps	D. W. Bingham.
Howell	June 27	Conference with Mr. Bachelor on stream pollution	F. G. Legg.
Hudson	Oct. 15	Nuisance	F. G. Legg.
Hudson	Mar. 7	Water and sewer plans	F. G. Legg.
Imlay City	July 21	Sewage disposal	D. W. Bingham.
Island Lake	Feb. 15	Ice inspection	D. W. Bingham.
Iron Mountain	June 9	Sewerage	D. W. Bingham.
Ironwood	Dec. 16	Investigation of water supply	J. W. Follin.
Ironwood	June 8	Conference with Mr. Smeeth, of Ironwood & Bessemer Ry. & Lt. Co., regarding water filtration plant	D. W. Bingham.
Jackson	Aug. 31	Inspection of State building	D. W. Bingham.

TABLE NO. 9.—*Continued.*

Location.	Date.	Subject.	Engineer.
Jackson	Oct. 21	Inspection of Grand River	E. D. Rich.
Jackson	Dec. 3	Hearing before the Drain Commission on improvements of Grand River	E. D. Rich.
Jackson	Feb. 16	City water supply and sewerage. Drainage in Jackson County	F. G. Legg.
Jackson	Mar. 25	Grand River sanitary survey	J. W. Follin.
Jackson	Apr. 22	Grand River sanitary survey	J. W. Follin.
Jackson	May 6	Grand River sanitary survey	J. W. Follin.
Kalamazoo	May 25	Pollution of Portage Creek	E. D. Rich.
Kalamazoo	June 30	Pollution of Kalamazoo River	E. D. Rich.
Kent City	June 1	Conference at Grand Rapids on Kent City sewage disposal	J. W. Follin.
Kent County	Mar. 15	Sewage disposal at Poor Farm	E. D. Rich.
Kinde	Apr. 12	Submission of question sheets	D. W. Bingham.
Laingsburg	Sept. 30	School house sanitation	D. W. Bingham.
Lake Linden	June 7	Submission of plans	D. W. Bingham.
Lake City	Apr. 27	Submission of plans	D. W. Bingham.
Lake Odessa	May 11	Sewerage	F. G. Legg.
Lansing	Sept. 25	Garbage nuisance	F. G. Legg.
Lansing	Oct. 11	Inspection of garbage disposal	F. G. Legg.
Lansing	Oct. 11	Conference with C. B. Beasom on industrial water connections	E. D. Rich.
Lansing	Dec. 16	Public address on "Home Ventilation"	E. D. Rich.
Lansing	Mar. 25	Conference with Mrs. Scovill regarding a cesspool in Lansing Township	F. G. Legg.
Lansing	Apr. 10	Inspection of Lansing water supply	F. G. Legg.
Lansing	Apr. 27	Conference on industrial water connections	E. D. Rich.
Lansing	May 23	Conference with Mr. Ellis on water purification	E. D. Rich.
Lansing	June 22	Conference with Mr. Brown and Mr. Ferguson on sewage disposal for sub-division in Lansing	D. W. Bingham.
Lansing Twp	Oct. 26	Typhoid fever investigation	F. G. Legg.
Lansing Twp	Nov. 12	Well pollution at dairy farm	F. G. Legg.
Lapeer	July 14,15	Sewage disposal at Michigan Home and Training School	F. G. Legg.
Lapeer	July 14,15	Sewage disposal at Michigan Home and Training School	D. W. Bingham.
Lapeer	July 27,28	Sewage disposal at Michigan Home and Training School	D. W. Bingham.
Lapeer	Oct. 6	Sewage disposal at Michigan Home and Training School	F. G. Legg.
Lapeer	Oct. 12	Sewage disposal at Michigan Home and Training School	F. G. Legg.
Lapeer	Oct. 12	Sewage disposal at Michigan Home and Training School	E. D. Rich.
Lapeer	Oct. 22	Sewage disposal at Michigan Home and Training School	F. G. Legg.
Lapeer	Apr. 4	Sewerage for Michigan Home and Training School	E. D. Rich.
Lapeer	Apr. 18,19	Sewerage for Michigan Home and Training School	F. G. Legg.
Lawndale	Sept. 25	Creamery nuisance	E. D. Rich.
Lawton	Mar. 18	Submission of maps	D. W. Bingham.
Leslie	Mar. 22	Conference with Mr. Pierson at Lansing on Leslie school house	F. G. Legg.
Leonard	Apr. 18	Submission of question sheets	D. W. Bingham.
Leslie	Mar. 29	Water supply and sewerage	F. G. Legg.
Lexington	Apr. 11	Submission of question sheets	D. W. Bingham.
Linden	Mar. 8	Water and sewer question sheets	D. W. Bingham.
Litchfield	Mar. 21	Sewer and water question sheets	D. W. Bingham.
Long Lake, (Genesee Co.)	July 14	Resort sanitation	D. W. Bingham.
Lowell	Jan. 20	Conference with Mr. J. McVean at Grand Rapids on Lowell water maps	D. W. Bingham.

TABLE NO. 9.—*Continued.*

Location.	Date.	Subject.	Engineer.
Ludington	Dec. 23	Water supply	D. W. Bingham.
Ludington	Mar. 16	Water supply and laboratory control of sterilization	J. W. Follin.
Mackinac Island	Oct. 12, 13	Typhoid investigation	J. W. Follin.
Mackinac Island	Mar. 2	Conference with Smith, Hinchman & Grylls at Detroit	J. W. Follin.
Manchester	Mar. 21	Water and sewer question sheets	D. W. Bingham.
Manchester	May 31	Sewerage	F. G. Legg.
Manistique	June 2	Public water supply	D. W. Bingham.
Marcellus	Nov. 1	Conference with Mr. Bates on sewerage	F. G. Legg.
Marcellus	Dec. 9	Sewerage	F. G. Legg.
Marine City	Dec. 19	Water supply	D. W. Bingham.
Marine City	Mar. 31	Water maps and laboratory control of sterilization	J. W. Follin.
Marine City	Apr. 6	Water supply and laboratory control of sterilization	J. W. Follin.
Marine City	May 11	Water supply and laboratory control of sterilization	J. W. Follin.
Marine City	May 18	Water supply and laboratory control of sterilization	J. W. Follin.
Marion	Sept. 10	Water supply and sewerage	D. W. Bingham.
Marlette	Aug. 11, 12, 26	Sewerage	D. W. Bingham.
Marlette	Sept. 6, 7, 8	Sewerage	D. W. Bingham.
Marlette	Sept. 14, 15, 16	Sewerage	D. W. Bingham.
Marlette	Sept. 6	Sewage disposal	F. G. Legg.
Marlette	Dec. 8	Sewerage	D. W. Bingham.
Marquette	Dec. 12	Water supply investigation	J. W. Follin.
Mason	Nov. 18	Sewerage nuisance at county jail	F. G. Legg.
Mason	Mar. 29	Water supply and sewerage	F. G. Legg.
Mason	May 8	Conference at Lansing with W. E. Zimmer on Mason sewer system	F. G. Legg.
Mayville	July 9	Creamery nuisance and sewage disposal	F. G. Legg.
Mayville	Sept. 16	Sewerage	D. W. Bingham.
Mayville	Oct. 26	Sewerage and general sanitation	D. W. Bingham.
Mayville	June 16	Conference with Geo. B. Felton on Mayville maps	F. G. Legg.
Maybee	Mar. 24	Sewer and water question sheets	D. W. Bingham.
McBain	Aug. 19	Water supply	D. W. Bingham.
McBain	Apr. 28	Public water supply	D. W. Bingham.
Menominee	Dec. 15	Investigation of water supply	J. W. Follin.
Menominee	Apr. 21	Water supply	E. D. Rich.
Menominee	May 26, 27	Water supply and laboratory instruction	E. L. Waterman.
Menominee	June 12	Conference with Prof. Hoad at Ann Arbor on Menominee filter plant	E. D. Rich.
Middleville	May 13	Public water supply	D. W. Bingham.
Midland	Feb. 8	Public address at M. A. C.	E. D. Rich.
Midland	Nov. 17	Water supply	D. W. Bingham.
Midland	Nov. 18	Conference with R. W. Roberts at Saginaw on Midland water	D. W. Bingham.
Milan	Mar. 29	Water supply and sewer maps	D. W. Bingham.
Milford	Feb. 4	Submission of maps	D. W. Bingham.
Milwaukee, Wis.	Nov. 3	Inspection of sewage disposal	E. D. Rich.
Milwaukee, Wis.	Feb. 26	Inspection of Pfester & Vogel Tannery activated sludge sewage disposal experiments	J. W. Follin.
Monroe	July 16	Typhoid investigation	J. W. Follin.
Monroe	July 18, 19, 20, 21	Typhoid investigation	J. W. Follin.
Monroe	July 23	Typhoid investigation	D. W. Bingham.
Monroe	July 28, 29, 30, 31, Aug. 1 and 2	Typhoid investigation	D. W. Bingham.
Monroe	Aug. 1	Typhoid investigation	D. W. Bingham.
Monroe	July 19, 20, 21, 22, 23, 24, 30, 31, Aug. 7	Typhoid investigation	F. G. Legg.
Monroe	Aug. 7, 8, 9	Typhoid investigation	J. W. Follin.

TABLE NO. 9.—*Continued.*

Location.	Date.	Subject.	Engineer.
Monroe	Aug. 7,8,9	Typhoid investigation	D. W. Bingham.
Monroe	Aug. 16 to Oct. 2	Typhoid investigation	A. H. Jewell.
Monroe	Aug. 9	Typhoid investigation conference	E. D. Rich.
Monroe	Aug. 16	Typhoid investigation conference	E. D. Rich.
Monroe	Aug. 16,17	Typhoid investigation	J. W. Follin.
Monroe	Aug. 24,25	Typhoid investigation	J. W. Follin.
Monroe	Sept. 6	Typhoid investigation	J. W. Follin.
Monroe	Sept. 15	Typhoid investigation	J. W. Follin.
Monroe	Sept. 24,25, 26,27,28	Typhoid investigation	J. W. Follin.
Monroe	Sept. 30	Typhoid investigation	J. W. Follin.
Monroe	Oct. 1,2	Typhoid investigation	A. H. Jewell.
Monroe	Nov. 1 to 6	Typhoid investigation	A. H. Jewell.
Monroe	Nov. 1,3	Typhoid investigation	J. W. Follin.
Monroe	Dec. 30	Special meeting of State Board of Health on Monroe water purification	E. D. Rich.
Monroe	Dec. 21	Hearing at Detroit on the purity of Monroe water supply	D. W. Bingham.
Monroe	Dec. 23	Water supply investigation	J. W. Follin.
Monroe	Jan. 3	Water supply	J. W. Follin.
Monroe	Mar. 3	Water supply	J. W. Follin.
Monroe	May 12	Water supply	J. W. Follin.
Morenci	Mar. 13	Sewerage	F. G. Legg.
Mt. Clemens	Feb. 3	Submission of maps	D. W. Bingham.
Mt. Clemens	Feb. 9	Public address before Mich. Drain Assn. Com.	J. W. Follin.
Mt. Morris	Apr. 18	New water supply	D. W. Bingham.
Mt. Pleasant	Feb. 21	Sewerage	F. G. Legg.
Mt. Pleasant	Mar. 8	Conference at Lansing on Mt. Pleasant sewerage	E. D. Rich.
Mt. Pleasant	Mar. 30	Conference at Lansing with Mr. Marsh on Mt. Pleasant sewerage	F. G. Legg.
Munising	Dec. 13	Investigation of water supply	J. W. Follin.
Muskegon Hts	Sept. 21	Tannery wastes at the C. G. Fleckenstein tannery	J. W. Follin.
Muskegon Hts	Dec. 6	Installation of sewerage system	J. W. Follin.
Muskegon Hts	Dec. 20	Public address on sewerage	F. G. Legg.
Muskegon Hts	May 5	Sewage disposal for Standard Malleable Iron Co.	D. W. Bingham.
Negaunee	May 27	Sewerage	E. L. Waterman.
Newark, N.Y.	Sept. 10	Inspection of sewage disposal	E. D. Rich.
New Baltimore	Sept. 2	Water supply and sewerage	D. W. Bingham.
Niles	Mar. 16	Submission of maps. Conference with Supt. of Niles Water Co. regarding maps	D. W. Bingham.
Niles	Mar. 17	Conference with W. J. Cleary on Niles water and sewer maps	D. W. Bingham.
North Adams	May 31	Sewerage	F. G. Legg.
North Branch	July 29	Sewage disposal	F. G. Legg.
North Branch	Feb. 2	Conference with B. T. Coleman, of Detroit, on water supply for North Branch	D. W. Bingham.
North Branch	Feb. 7	Location of wells for public water supply	D. W. Bingham.
North Branch	Mar. 8	Conference at Lansing on North Branch water supply	E. D. Rich.
North Branch	Apr. 27	Sewage disposal for Evangelical Lutheran Deaf Mute Institution	E. L. Waterman.
North Muskegon	Dec. 6	School house sanitation	J. W. Follin.
Northville	Apr. 12	River Rouge sanitary survey	J. W. Follin.
Norway	July 2	Conference on water purification	E. D. Rich.
Norway	Dec. 15	Water supply investigation	J. W. Follin.
Oakwood	Mar. 25	Conference with E. L. Russell, of Detroit, on Oakwood sewerage	D. W. Bingham.
Omer	May 24	Submission of question sheets	D. W. Bingham.
Onaway	May 26	Submission of plans	D. W. Bingham.
Orchard Lake	June 28	General sanitation	D. W. Bingham.
Orion	July 8	Resort sewage disposal	F. G. Legg.
Orion	Jan. 25	Ice inspection	D. W. Bingham.
Orion	Feb. 15	Ice inspection	D. W. Bingham.
Orion	Feb. 24	Submission of maps	D. W. Bingham.
Orion	June 5	Public address before Common Council on sewerage and garbage	E. D. Rich.

TABLE NO. 9.—*Continued.*

Location.	Date.	Subject.	Engineer.
Orion	Apr. 19	Submission of question sheets	D. W. Bingham.
Otsego	May 11	Submission of plans and new water supply	D. W. Bingham.
Otsego	Apr. 7	Conference with Jas. R. Rumsey, of Grand Rapids, on submission of plans and water situation at Otsego	D. W. Bingham.
Oxford	Feb. 24	Submission of maps	D. W. Bingham.
Paw Paw	May 22	Nuisance	F. G. Legg.
Pellston	May 27	Submission of question sheets	F. G. Legg.
Petersburg	Mar. 22	Water and sewer question sheets	D. W. Bingham.
Petoskey	July 6	Water supply and sewage disposal	D. W. Bingham.
Petoskey	Dec. 27	Sewage disposal	D. W. Bingham.
Petoskey	May 20	Water supply and sewerage	D. W. Bingham.
Pigeon	Aug. 4	Drain nuisance	D. W. Bingham.
Pigeon	Sept. 30	Conference with Dr. Werne	D. W. Bingham.
Pigeon	Apr. 12	Conference on the water and sewer situation	D. W. Bingham.
Pine Lake	July 16	Investigation of nuisance	E. D. Rich.
Plainwell	Aug. 3	Conference on sewerage and sewage disposal	E. D. Rich.
Plainwell	Mar. 7	Conference at Lansing on Plainwell sewerage	E. D. Rich.
Plainwell	June 16	Conference with Fred Gregory on River Rouge sanitary survey	J. W. Follin.
Plymouth	Feb. 4	Submission of maps	D. W. Bingham.
Plymouth	Feb. 23	Sewerage and drainage nuisance	D. W. Bingham.
Plymouth	Apr. 5	River Rouge sanitary survey	J. W. Follin.
Plymouth	Apr. 14	Public address before Common Council on "Sewerage"	J. W. Follin.
Pontiac	Oct. 25	Garbage disposal	D. W. Bingham.
Pt. Austin	Apr. 12	Submission of plans	D. W. Bingham.
Pt. Huron	Dec. 18	Water supply	D. W. Bingham.
Pt. Huron	Mar. 30, 31	Water supply and laboratory control of sterilization	J. W. Follin.
Quincy	Jan. 4	Water supply	F. G. Legg.
Reading	June 5	Sewer maps	F. G. Legg.
Redford	Mar. 25	Conference at Detroit with Russell Murdoch on water supply and sewerage for Redford	D. W. Bingham.
Redford	Mar. 27	Water and sewerage	D. W. Bingham.
Redford	Apr. 12	River Rouge sanitary survey	J. W. Follin.
Redford	June 2	Sewerage	E. D. Rich.
Reed City	Aug. 4	Conference on sewerage and sewage disposal	E. D. Rich.
Reed City	Sept. 15	Conference on sewage disposal	E. D. Rich.
Reed City	Dec. 15	Conference at Lansing with Secretary of State Board of Health and Mr. Clark, of Reed City, on Reed City sewerage	F. G. Legg.
Reed City	Jan. 29	Sewage disposal	J. W. Follin.
Reed City	Apr. 27	School house sanitation; sewerage and sewage disposal	D. W. Bingham.
Reed City	May 19	Sewerage and sewage disposal	D. W. Bingham.
Remus	Aug. 31	School house sewage disposal	J. W. Follin.
River Rouge	Dec. 4	Sanitary survey	J. W. Follin.
Rochester, N. Y.	Sept. 7, 8, 9, 10	American Public Health Association meeting	E. D. Rich.
Rochester	Feb. 24	Submission of maps	D. W. Bingham.
Rockford	Oct. 5, 6	New water supply	J. W. Follin.
Rockford	May 12	Conference at Lansing with Dr. Strong on Rockford water supply	E. D. Rich.
Rockford	May 25	Water supply	J. W. Follin.
Royal Oak	Dec. 9	Sewerage	D. W. Bingham.
Royal Oak	Mar. 1	Sewerage	D. W. Bingham.
Royal Oak	Mar. 10	Hearing at Detroit before the State Board of Health on Royal Oak sewerage	D. W. Bingham.
Royal Oak	Mar. 10	Sewerage and sewage disposal	E. D. Rich.
Royal Oak	Mar. 10	Sewerage and sewage disposal	D. W. Bingham.
Royal Oak	Apr. 3	Conference at Lansing with Harry Gardner on sewerage and garbage for Royal Oak	E. D. Rich.
Royal Oak	Apr. 4	Sewerage	E. D. Rich.
Royal Oak	May 31	Conference at Lansing with F. W. Clawson on sewerage north of Royal Oak	E. D. Rich.
Richmond	Feb. 3	Conference at Mt. Clemens with W. J. Lehner on the submission of Richmond maps	D. W. Bingham.
Saganing	July 9	Garbage nuisance	F. G. Legg.

TABLE NO. 9.—*Continued.*

Location.	Date.	Subject.	Engineer.
Saginaw.........	Nov. 27......	Conference at Lansing with W. F. Johnson on water filtration at Saginaw..............	E. D. Rich.
Saginaw.........	Nov. 30......	Public address on water filtration............	E. D. Rich.
Saginaw.........	Nov. 30......	Public address on pure water and general sanitation..............................	J. W. Follin.
Saginaw.........	Dec. 1......	General sanitation.........................	J. W. Follin.
Saginaw.........	Dec. 21......	Conference at Lansing with Mr. Pierson on school house sewage disposal at Saginaw...	E. D. Rich.
Saline...........	Mar. 23......	Submission of maps.........................	D. W. Bingham.
Sandusky........	Feb. 23......	Sewage disposal...........................	E. D. Rich.
Sanford.........	Oct. 13......	Conference at Lansing with the Governor on the Sanford Sanatorium..................	E. D. Rich.
Saranac.........	Apr. 7......	Conference with Mr. Jas. Fitzpatrick at Grand Rapids regarding submission of Saranac maps.................................	D. W. Bingham.
Saratoga, N. Y...	Aug. 28......	Inspection of sewage disposal...............	E. D. Rich.
Sault Ste. Marie..	June 1......	Submission of plans........................	D. W. Bingham.
Schenectady, N. Y.........	Aug. 31......	Inspection of sewage disposal...............	E. D. Rich.
Shelby..........	May 3......	Submission of plans........................	D. W. Bingham.
Sherman........	May 2......	Submission of question sheets...............	D. W. Bingham.
Shepherd........	May 19......	Submission of plans........................	D. W. Bingham.
Sibley...........	June 20......	Sewage disposal...........................	E. L. Waterman.
South Haven....	Dec. 17......	Water supply..............................	D. W. Bingham.
Stambaugh......	June 8......	Submission of plans........................	D. W. Bingham.
Standish........	May 24......	Submission of plans........................	D. W. Bingham.
St. Clair.........	July 23......	Drain nuisance............................	D. W. Bingham.
St. Clair.........	Dec. 18......	Water supply..............................	D. W. Bingham.
St. Clair.........	Jan. 14......	Conference at Lansing on water supply and sewerage at St. Clair.....................	E. D. Rich.
St. Clair.........	Feb. 14......	Water supply..............................	J. W. Follin.
St. Clair.........	Mar. 31......	Water supply and laboratory control of sterilization..............................	J. W. Follin.
St. Clair.........	Apr. 4......	Water supply and laboratory control of sterilization..............................	J. W. Follin.
St. Joseph.......	Dec. 17......	Water supply..............................	D. W. Bingham.
St. Joseph.......	Feb. 1......	Water supply..............................	F. G. Legg.
St. Joseph.......	Feb. 24......	Water supply and laboratory control.........	J. W. Follin.
St. Joseph.......	May 23, 24...	Water supply and laboratory control.........	J. W. Follin.
Sturgis..........	July 14......	Inspection of sewage disposal...............	E. D. Rich.
Sturgis..........	Oct. 18......	Sewage disposal...........................	F. G. Legg.
Sturgis..........	Dec. 31......	Water supply and sewage disposal...........	F. G. Legg.
Sturgis..........	Mar. 18......	Submission of maps.........................	D. W. Bingham.
Sturgis..........	May 29......	Water supply and sewerage..................	F. G. Legg.
Three Oaks......	May 12......	Sewerage and sewage disposal...............	D. W. Bingham.
Traverse City....	Dec. 24......	Water supply..............................	D. W. Bingham.
Traverse City....	Feb. 17......	Water supply..............................	E. D. Rich.
Traverse City....	May 1......	Installation of liquid chlorine and laboratory..	D. W. Bingham.
Trenton.........	Oct. 22......	General sanitation.........................	D. W. Bingham.
Trenton.........	Nov. 9......	General sanitation.........................	D. W. Bingham.
Trenton.........	Feb. 1......	Typhoid investigation and submission of maps.	D. W. Bingham.
Trenton.........	Feb. 3......	Typhoid fever investigation.................	E. D. Rich.
Trenton.........	Feb. 3......	Sanitary survey prospectus..................	J. W. Follin.
Trenton.........	Feb. 29......	Conference with the Health Officer on the typhoid situation........................	D. W. Bingham.
Trenton.........	Feb. 9 to Mar. 31.....	Sanitary survey...........................	E. L. Waterman.
Trenton.........	Apr. 1 to 12...	Sanitary survey...........................	E. L. Waterman.
Trenton.........	May 9......	Public address before Common Council on "Sewerage"...........................	E. D. Rich.
Trenton.........	June 6......	Sewerage..................................	E. L. Waterman.
Twining.........	May 24......	Submission of question sheets...............	D. W. Bingham.
Waldron........	Mar. 13......	Sewerage..................................	F. G. Legg.

TABLE NO. 9.—*Concluded.*

Location.	Date.	Subject.	Engineer.
Warren	Apr. 17	Submission of question sheets	D. W. Bingham.
Washington, D.C.	Mar. 21, 23	Conference with engineers at meeting of International Joint Commission on Pollution of Boundary Waters	E. D. Rich.
Waterford	Feb. 17	Ice inspection	D. W. Bingham.
Watervliet	Feb. 2	Proposed water supply	F. G. Legg.
Wayland	May 11	Submission of maps	D. W. Bingham.
Wayne	Feb. 23	Installation of chemical closets at public school	D. W. Bingham.
Wayne	Apr. 14	River Rouge sanitary survey	J. W. Follin.
Wayne County	Mar. 28	Conference at Detroit with E. F. Stark on sewage disposal for St. Francis Home for Boys	D. W. Bingham.
Wayne	June 23, 24	River Rouge sanitary survey	J. W. Follin.
West Branch	May 23	Submission of plans	J. W. Follin.
Whitehall	May 4	Submission of plans and general sanitation	D. W. Bingham.
Williamston	Sept. 3	General sanitation	D. W. Bingham.
Whittemore	June 12	Creamery nuisance	F. G. Legg.
Wyandotte	Dec. 21	Water supply investigation	J. W. Follin.
Wyandotte	Feb. 3	Sanitary survey prospectus	J. W. Follin.
Wyandotte	Feb. 3	Typhoid investigation	E. D. Rich.
Wyandotte	Feb. 9 to Mar. 31	Sanitary survey	E. L. Waterman.
Wyandotte	Apr. 1 to 14	Sanitary survey	E. L. Waterman.
Wyandotte	June 19	Water supply	E. L. Waterman.
Wyandotte Hts.	Oct. 12	Typhoid investigation	D. W. Bingham.
Wyandotte Hts.	Oct. 20	Typhoid investigation	D. W. Bingham.
Wyandotte Hts.	Nov. 8	Typhoid investigation	D. W. Bingham.
Wyandotte Hts.	Feb. 29	Conference with Solvay Process Co. regarding filtered water for Wyandotte Heights	D. W. Bingham.
Yale	Sept. 17	Conference on storm sewerage	E. D. Rich.
Yale	Apr. 10	General conference and submission of plans	D. W. Bingham.
Zeeland	Dec. 9	Conference at Lansing with Mr. Boonstra, of Zeeland, regarding water works	E. D. Rich.
Zeeland	Dec. 22	Water supply	D. W. Bingham.
Zeeland	May 31	Inspection of sewage disposal plant	J. W. Follin.

REPORT OF STATE SANITARY ENGINEER FOR YEAR ENDING JUNE 30, 1917.

DR. R. M. OLIN, Secretary State Board of Health, Lansing, Michigan.

Dear Doctor:—I hand you herewith my report for the year ending June 30, 1917.

ORGANIZATION OF THE OFFICE FORCE.

On February 1, 1917, Mr. Follin resigned to accept a position as Sanitary Engineer for the City of Flint, and his place was taken by Mr. Jacob L. Crane. On June 1, 1917, Mr. Albert H. Jewell became a member of the force.

FILING OF PLANS FOR WATER AND SEWER SYSTEMS.

Tables 1 to 6 inclusive hereto attached show the progress made to date in the filing of plans for the water and sewer systems, under the requirements of Act 98, P. A. 1913.

EXAMINATION OF PLANS FOR PUBLIC BUILDINGS.

Table No. 8 shows the list of plans for public buildings or additions thereto, which have been recommended for approval.

CONFERENCES, CONSULTATIONS AND INSPECTIONS.

In Table No. 9 may be found a list, alphabetically arranged, of the visits made during the year for the purpose of assisting the municipalities or city officials in solving their problems of sanitation. The growth of this work is shown by months on the diagram on page 111.

The problems deserving special mention are as follows:

1. *Alma Water Supply:* During 1916 bonds were voted for the improvement of the water supply of Alma. Fire protection for the municipality is afforded by water pumped from the polluted Pine River which flows through the city and receives the flow from several large sewers. This water supply is not supposed to be used for drinking purposes, but of course it is well nigh impossible to prevent everybody from using such water if it is furnished through the city mains. The drinking water supply of the city of Alma is furnished through numerous private flowing wells which are driven into a water bearing stratum lying below certain protective coverings of dense material.

Wells drawing from shallow depths in Alma would be subject to pollution from surface sources. After making inquiry into the geological formation in the vicinity of Alma we advised the city officials that prospecting for ground water supply would not be likely to result in success inasmuch as the water horizon from which these private flowing wells were taking their supply was in all probability not sufficient to furnish the city with the required quantity. We also called their attention to the fact that if much pumping from this vein of water were necessary it would in all probability cut off the flow from the private flowing wells. These would then become a menace to the safety of the deep-seated water on account of their giving free access to polluted surface water. In spite of our advice to the contrary the tests were carried out.

2. *Alpena Water Supply:* During 1916 the city of Alpena adopted the commission form of government with a city manager. An engineer was appointed to this position and immediately interested himself in the purity of the water supply. By a careful study of the results of laboratory analyses and control of the chlorination process on the basis of the laboratory tests a great improvement in the condition of the water supplied to consumers was soon made evident. It is believed that the results obtained in this way represent the maximum efficiency of the chlorination plant as now used at Alpena, but owing to the high organic content of the raw water and to the tastes sometimes found in the treated water we do not regard the chlorination process as a final solution of the Alpena problem. It is hoped that as soon as the city finds itself in a financial position to afford a filter plant one will be constructed.

3. *Ann Arbor Sanitary Survey:* During the summer of 1916 Ann Arbor experienced an exceptionally severe epidemic of typhoid fever which originated in one dairy of the municipal milk supply. This epidemic led to a thorough investigation of all of the sanitary conditions in the city of Ann Arbor, particularly with regard to the food supply. The inspection included all of the dairies furnishing milk to Ann Arbor, some 80 in number, restaurants, boarding houses, hotels, groceries, meat markets, bakeries and confectioneries. The number, age and name of the employees of the various food establishments were recorded and histories of previous typhoid fever and other infectious diseases were taken by the inspectors in order to ascertain whether any diseased persons or typhoid carriers were in a position to contaminate the food which they handled before it was served to the patrons. In all places the general hygienic conditions were observed and recommendations were made where necessary for improvement. Special attention was given to the cleanliness of the workshops or salesrooms. The facilities for the storage and removal of garbage and refuse, and the efforts being made to prevent flies from gaining access to both food and waste material were noted. The toilet conveniences provided for the employees were inspected, and recommendations made for improvements where necessary. The outside work consisted in examinations and inspections of premises for the location of cesspools, privies, barns for housing animals, chicken pens and private wells. The investigation disclosed the existence of 808 privies in use, of which 118 were on premises where sewer connections had been made but the privies had not been put out of use. These privies were immediately ordered closed. Written orders were issued directing the owners of 442 premises to connect with the sewer. The remaining privies not ordered abolished were situated on premises where sewer connections or water connections were not available, and it was therefore impossible to abolish them at that time. The privies inspected were of the crudest sort. Only 15 concrete vaults which prevented seepage into the soil were discovered out of a total of 808 inspected. Classifying the whole number from a strictly sanitary viewpoint with respect to the

methods of dissemination of disease commonly recognized only eight were listed as good, 127 as fair, while the remaining 675 were described as filthy. Of the 248 privies on premises which cannot be connected with the sewer 186 were ordered cleaned and disinfected to relieve somewhat their insanitary condition.

There were discovered approximately 200 barns in Ann Arbor in which either horses or cows are kept. Inspection showed a total of over 400 horses and 30 cows.

It is required by city ordinance that manure be hauled away every two weeks between May 1st and November 1st. A regulation of the city Board of Health requires that it be kept in a closed receptacle at the barn thereby preventing the breeding of flies. The survey showed that satisfactory covered receptacles were in use in only ten places. Over 150 written orders were issued requiring the use of covered receptacles for manure and in half of these the premises were ordered cleaned, the manure having accumulated for longer than the two weeks period mentioned in the ordinance.

On over 600 premises either fowls or domesticated animals were raised. In 500 cases chickens alone were found totaling approximately 13,000. On the remaining premises one or more variety of fowl, chickens, ducks, geese or domesticated animals such as hares or guinea pigs were discovered. Several pens of pigs were found in the outskirts and these were ordered removed beyond the city limits.

Any property owner is forbidden by city ordinance to allow fowls or domesticated animals to run at large in the city to the damage or annoyance of any of its inhabitants. In accordance therewith over 70 written orders were issued directing the cooping of fowls or animals running at large, and nearly 40 orders for the cleaning of premises which had become offensive from lack of attention to proper disposal of the manure.

In the course of the survey 22 construction privies were located and written orders served on the contractors to put them in a sanitary condition. A dry earth closet, chemical closet, or a privy situated over a manhole was allowed to be substituted for those in use.

As a part of the survey all private wells were located and information obtained concerning the extent of their use, their character, whether open or driven, their depth, and their general protection against surface contamination noted. Over 560 were found of which 357 were classified as open wells and 203 as driven wells. The estimated population using these supplies for drinking purposes is 4,500, approximately 15 per cent of the total population of the city.

One hundred and ninety-one bacteriological examinations were made of these wells, showing over 70 per cent of those sampled to be unsafe for use. As a result of our efforts the following recommendations were made by the Health Officer to the city authorities:

1. The revision of the milk ordinance to require:

a. That only pasteurized or Grade A certified milk can be sold in the city.

b. That milk licenses can be granted only with the approval of the Health Officer.

c. That a milk distributor must obtain the consent of the Health Officer before taking on a new producer.

d. That the milk distributors shall submit monthly reports to the Health Officer showing the names of their producers.

e. That milk producers and distributors shall communicate instantly to the Health Officer of Ann Arbor the existence of a case of contagious disease among their employees or in their own household or in the household of the employees.

f. That all milk delivered to houses under quarantine shall be in fibre containers which cannot be used again.

2. The revision of the Nuisance Ordinance as follows:

a. The revision and amendment of Section 6 to provide for:

1. The prohibition of cesspools.

2. The prohibition of privies within sewered districts. (This would remedy a conflict between the sewer ordinance and this Section 6.)

3. The requirement that all premises which cannot obtain a sewer connection shall install either a chemical closet or a dry earth closet or such type of sanitary closet as the Health Officer shall approve.

b. The addition of a new section to regulate the construction and maintenance of toilet arrangements on construction work, to provide for:

1. On street excavation work the placing of the privy building over a sanitary sewer manhole or the use of a portable chemical outfit or such other arrangement as the Health Officer shall approve.

2. On building construction the use of chemical closets, dry earth privies or such type of closets as the Health Officer shall approve.

c. The revision of Section 7 which relates to the care of stables and to the removing of manure every two weeks from May 1st to November 1st, which shall provide:

1. That manure shall be kept in closed receptacles between times of removal.

3. The passing of an ordinance to regulate food establishments, to provide for:

a. Special power of inspection of groceries, meat markets, bakeries, restaurants, hotels, boarding houses, confectioneries and fruit stands to be in the hands of the Health Officer or his agents.

b. Physical and medical examinations of employees by the Health Officer.

c. Standardization of the weight of bread loaves and requiring all bread sold to be covered with sanitary wrappers.

d. The display of fruits or vegetables on the outside of stores or on venders' carts or wagons only if screened and above the reach of dogs or other animals.

4. The passing of an ordinance regulating the sale of bottled waters or bottled soft drinks in the city, to provide:

a. That all bottles shall be thoroughly washed and sterilized before using.

b. That these products shall conform to a standard of purity fixed by the Health Officer.

c. That no bottles shall be removed from a household where there is contagious disease without the consent of the Health Officer.

4. Bad Axe Sewerage and Sewage Disposal: The construction of a system of sanitary sewers and treatment plant consisting of an Imhoff tank and sand filters is now under way at Bad Axe, construction having been started during the summer of 1916. The completion of this project has been delayed by the difficult structural conditions encountered on the work.

5. *Battle Creek, Pollution of Kalamazoo River:* Nothing further has been done on this project since the last report.

6. *Battle Creek, Camp Custer, U. S. A. Cantonment:* Our advice has been sought on many matters connected with the construction and sanitation of this important project. It is proposed to supply the camp with water obtained from the Marshall sandstone through drilled wells near the Kalamazoo River. This is the geological formation which furnishes water to the city of Lansing and to Battle Creek as well as to other municipalities. We have, therefore, approved this supply provided a sufficient quantity can be obtained. We are keeping in close touch with the details of the design and construction of the sewer system and of the treatment which will be given the sewage before it is discharged into the Kalamazoo River.

7. *Bath Typhoid Fever Investigation:* An epidemic of over 40 cases of typhoid fever in and near the unincorporated community of Bath, Ingham County, just north of Lansing, is being investigated. Inasmuch as the cases seem to have no common water or milk supply the outbreak presents many interesting features.

8. *Bay City Typhoid Fever Investigation:* At the request of the Bay City health authorities an investigation of a typhoid fever epidemic was made during October, 1916, a complete report of which was submitted to the Secretary of the State Board of Health and the officials of Bay City. This epidemic began in July but did not assume serious proportions until the latter part of September when two or three new cases were being reported to the Health Officer daily. At the time of the completion of our report, November 1st, there had been 144 cases of typhoid fever, with eight deaths.

The investigation showed that the epidemic was water-borne and due to a contaminated public water supply in East Bay City. At the East Side pumping station water is drawn from Saginaw Bay and Saginaw River. The river carries the sewage from the towns and cities of the Saginaw Valley, most of the sewage of Bay City being discharged into the river above the water works intake. Typhoid has been prevalent in Bay City for many years, the average death rate for the period of 1900-1915 being 35 per 100,000. Under the existing conditions it is not reasonable to expect that this high rate will be materially reduced and a radical change in the water supply is imperative for the preservation of the public health. The seriousness of the situation is recognized by the city authorities.

9. *Bay City Water Supply:* After the presentation of our report on the typhoid fever epidemic to the municipal authorities and a thorough discussion of remedial measures, consulting engineers were engaged to study the problem of water supply, and to make recommendations for improvements. The information collected by this department in the study of the typhoid epidemic was placed at the disposal of the engineers and every facility afforded them for studying the problem at hand. As a result of their labors a rapid sand filtration plant to supply the entire

city on both sides of the river was recommended and an estimate of the cost given in their report. The importance of immediate steps for the construction of this work was brought to the attention of the municipal authorities by the engineers and by representatives of the State Board of Health. At the time the report was submitted, however, the municipal election was approaching and it was decided to await the outcome of this before definite steps were taken. The result of the election was unfavorable to the water purification project in that officials were elected who had no particular interest in the scheme. This together with the advanced prices of material and labor due to war conditions seems to have effectively postponed this important improvement.

10. Brown City Sewerage and Sewage Disposal: Plans have been approved for the sewerage and sewage disposal system of Brown City, but no attempt has as yet been made to proceed with the construction, probably on account of the advent of high prices.

11. Buchanan Sewerage: The village of Buchanan is supplied with water from shallow wells within the built-up portion of the town. There are within 600 feet of the wells 22 privies, 32 cesspools, one pig pen and several barn yards and manure piles. One polluted stream passes within 20 feet of the municipal well, and another flows at a higher elevation about 800 feet away. The officials have been ordered to abolish the sources of pollution surrounding the village wells. As a result of this order the village officials employed an engineer to design a system of sewers with disposal plant. We have been in close touch with this engineer and his design and approved the plans.

12. Cadillac Water Supply: No substantial progress in the matter of negotiations between the Cadillac Water & Light Co. and the city officials have come to our notice since the last report.

13. Canning Factory Wastes: We have little progress to report on this problem during the past year. However, the Fremont Canning Co. has constructed a brush filter and made some attempt at solving the problem. Further experimentation will be carried on at this plant.

14. Decatur Typhoid Fever Investigation: There were 54 cases of typhoid fever in the village of Decatur between January 1 and October 1, 1916, most of them during July and August. As a result of a thorough investigation by a representative of the engineering division three typhoid fever carriers were discovered on the farm from which the milk supply of the village was obtained. The supply of milk from this source was cut off and an ordinance passed by the village council requiring the pasteurization of all milk sold in the village after October 1, 1916.

15. Detroit Sewerage: Several million dollars have been appropriated by the Detroit city council for the extension of the sewerage system to serve the outlying territory, part of which was recently taken into the city limits. The city engineer has prepared plans for outlets and lateral sewers to form a general system for the added territory. Great care has been taken in calculating sizes and the plan has been investigated in general by the engineering division of the State Board of Health with the city engineer, and found to be satisfactory. The appropriation for the year 1917 includes provision for the purchase of a tract of land upon which will be erected one of the plants for treating the sewage of the city in accordance with methods determined upon by Mr. Hubbell and with the approval of this office, and following the recommendations of the International Joint Commission on the Pollution of Boundary Waters. It is with satisfaction that we record this first step toward the realization of important improvements in the sanitary conditions of the Detroit River.

16. Dundee Proposed Water Supply: During the early part of 1917 the village of Dundee opened bids for the installation of a public water supply system. They will attempt to convert a highly mineralized and sulphurous water into a satisfactory municipal supply. Plans were submitted for our approval but such approval was withheld because of the fact that the department did not consider it wise to place responsibility upon the State Board of Health by approving a supply which in our opinion will not give entire satisfaction. The village authorities have been fully informed of our attitude on this point.

17. East Tawas Water Supply: The changes in pumping station equipment and reconstruction of the intake at East Tawas has been proposed and plans submitted to us for approval. An investigation was made and the raw water was found to be contaminated by sewage. The reconstruction plans as proposed were not approved and the officials were notified that the contemplated changes would not be likely to give a satisfactory drinking water, and that chlorination would probably be demanded. A subsequent investigation revealed the same general conditions and showed that the water was still unsafe for domestic use. The water works intake is being reconstructed and another study will be made upon its completion.

18. Engineering Bulletins: Engineering Bulletin No. 9 entitled "Water Filtration" was published during March, 1917. This pamphlet is designed to set forth the advantages to be gained by the filtration of public water supplies and is made up in such form as to be easily understood by the ordinary village official unfamiliar with the subject. The improvement in public health gained by the installation of filter plants in the various cities throughout the United States is plainly set forth in numerous diagrams, and pictures are shown indicating what these plans have accomplished. Engineering Bulletin No. 10 on "Water Chlorination" is about ready for the printer. This will contain the results of the operation of the sterilization plants in the state of Michigan together with a short description of the method and the advantages to be gained thereby. A bulletin on "Sewage Disposal for Small Towns" is in the course of preparation and we hope to publish this before the next report.

19. Flint River Pollution: During July, 1916, we were called upon to investigate the conditions of the Flint River below Flint, which had been such as to kill large numbers of fish, and to cause complaint from the village of Flushing. The specific trouble was probably due to crude oil which had escaped into the river from one of the industrial plants at Flint, but the investigation strengthened our belief that Flint must soon have sewage disposal facilities for its own sewage if the city is to preserve the purity of the river and keep out of court with its neighbors down the river. The matter was brought to the attention of the city engineer of Flint and as a result he offered Mr. Follin of this department a position in his office for the purpose of making a scientific study of all the phases of the river pollution question and the manner of providing proper sewage treatment for the city. A general study of the condition of the river has been undertaken as well as the supervision of the sewer design for the city of Flint in order that it may be carried on in such a way as to facilitate the economic solution of the sewage treatment problem.

20. Flint Water Supply: On account of the rapid growth of the city of Flint the water purification plant erected a few years ago has already reached the limit of its capacity and steps have been taken to double its size. The contract has been awarded to the Pittsburgh Filter Co. and an early completion is expected.

21. Fowlerville Sewerage: Plans have been prepared for a system of sanitary sewers with treatment by means of two Imhoff tanks for the village of Fowlerville. These plans have been completed and accepted by the village and approved by this department. No steps have as yet been taken for the commencement of construction.

22. Gladstone Sewerage: Plans have been approved for the improvement of the sewerage system of Gladstone by the construction of certain relief sewers and treatment by means of sedimentation in an Imhoff tank with provision for sterilization during such periods as may be deemed necessary to protect the water supply and bathing beach south of the sewer outlet.

23. Grand Rapids Sewage Disposal: No substantial progress has been reported during the past year on this subject. This is probably due to the political change that the city has undergone. Now that the commission form of government is in operation it is hoped that the problem will be given more serious consideration.

24. Grand Rapids Typhoid Fever Investigation: In November, 1912, the city of Grand Rapids put into operation a rapid sand filtration plant in order to supply its people with filtered river water which could be used for all domestic and industrial purposes, it being clarified and purified to adapt it for use as a drinking water and softened to make it suitable in boilers and in the household for washing purposes. Previous to this time the unfiltered Grand River water furnished through the city mains could not have been considered safe for drinking and the sale of water by various venders and the use of private wells supposedly safe was thereby greatly increased. A private company taking water from filter galleries and wells adjacent to the Grand River supplied a portion of the city.

With the advent of filtration has come some betterment in health conditions but it cannot be said that typhoid fever conditions have improved to a marked degree during the period following filtration, up to the end of 1916. This result may not be a surprise to those familiar with the prevalence of the disease in 1912 and who know its history since that time. Possibly the improvement which has been affected is all that could be expected from the purification of the city water supply not accompanied by the elimination of other sources of infection.

The average death rate for the four years, 1913 to 1916 inclusive, while filtered water was supplied shows a reduction of only 40 per cent over the average rate prevailing in 1900 to 1912 inclusive before filtration, and only 17 per cent of the average rate for the four years immediately preceding 1912.

This state of affairs unexplained would be an indictment against the present city supply in fulfilling one of its chief functions, the protection of public health. It would also serve to discountenance the construction of purification works and delay efforts to improve public health conditions elsewhere throughout the state. For this and other reasons a study of the typhoid fever conditions in Grand Rapids was undertaken to determine the source of infection to which the continued high prevalence of the disease since 1912 has been due and to ascertain whether the use of filtered water has served to maintain the high typhoid prevalence or whether the operation of other sources of infection have counteracted the benefits derived from the filtered water supply, thereby showing but a small balance in favor of the new supply.

In 1911 Dr. Allen J. McLaughlin of the U. S. Public Health Service, in commenting upon the conditions at Grand Rapids, stated that the majority of the typhoid patients were generally found to be users of well water and in many cases the insanitary privy was an accompanying menace on account of its close proximity to the wells. He reported that in 1907 a study of 398 cases showed 298 of them to be users of well water, while in 1908 out of the 192 cases only five were users of city water. His report also states that according to data collected by the Health Officer in 1907 the users of well water comprised one-half of the total population, and that they furnished 75 per cent of the typhoid. The evidence against the wells was definite and included repeated bacteriological examinations. The great obstacle at that time to the elimination of the wells was that the city water was also polluted and believed by many to be more dangerous than the wells. He advised the construction of a filter plant at that time, but cautioned the people that it would not be likely to effect a great immediate reduction in typhoid fever, but that substantial reduction would follow when, by means of a safe supply, the shallow wells and insanitary privies could be eliminated.

In 1915 Dr. C. C. Slemons, Health Officer of Grand Rapids, in commenting upon the typhoid death rate for 1914 is quoted as saying, "This high rate is due to the fact that the citizens are not using the city filtered water, which is pure.

"In the Sixth ward alone there are approximately 800 wells which are being used in preference to the city filtered water. Approximately 70 per cent of these wells are contaminated. From that ward, in 1914, we had 22 cases of typhoid fever and two deaths.

"In the Twelfth ward, where many wells are still being used, we had 26 cases and five deaths.

"In the Ninth ward, where wells are also used, there were 18 cases and two deaths.

"These three wards provided 40½ per cent of all the typhoid cases in the city and 33.3 per cent of all the deaths from that disease.

"These wards are without filtered water, but in the east side wards where the filtered water supply is being used almost exclusively, there were no cases or deaths during 1914.

"We are conducting a campaign of education, which I believe is better than drastic measures to compel citizens to connect their property with the city's filtered main suppply. This campaign is necessary because we are compelled to show the obstinate one that the city supply is purer than any well supply he could use.

"Many people believe that the water supplied by a private company is pure, but our records show that during two months of each year, in the early spring and fall, when the greatest seepage occurs, the water furnished by that company is unsafe."

In the Grand Rapids Press of May 26, 1916, a news item from the yearly report by Dr. Slemons for 1915 showed that 50 per cent of the typhoid cases and deaths occurred in the 4th, 6th, 9th and 12th wards, the 4th leading in both cases and deaths. Slightly less than 62 per cent of the Sixth ward wells were reported as bad and 35 per cent of the Ninth ward wells. In the Twelfth ward with few sewers, the wells were said to be exceptionally bad. The health officer stated that where city water was used the absence of typhoid was noticeable.

The investigation included:

1. A study of the tabulated results of the tests of water furnished by the municipal filter plant to the city of Grand Rapids.
2. A thorough physical examination of the plant of the private company supplying certain consumers.
3. A study of the results obtained by testing many samples of this water from time to time during the course of the investigation.
4. A thorough study of the quality of the private well supply.
5. A study of the milk supply.
6. A study of the records of cases of typhoid fever.
7. A study of the age and sex distribution of cases.
8. A study of the seasonal prevalence of typhoid.
9. The geographical distribution of cases.
10. The tabulation of the water used by each case, both at home and at work.

After a thorough study of all the foregoing factors the following conclusions were reached:

1. The average yearly prevalence of typhoid fever in Grand Rapids has not materially decreased in the years 1913-1916, since the introduction of filtered water; the average typhoid death rate for the four years 1909-1912 preceding filtration being 26.5 per 100,000 population and for the years 1913-1916 which followed, 22.1.
2. A reduction in typhoid deaths has been made in the months of June through October in the years 1913-1916, while the number from January through May has increased over those in the years 1909-1912.
3. The reported cases and the resultant deaths in 1913, the first year of filtered city water, were only half of those occurring in 1912, the last year of unfiltered water.
4. The yearly typhoid death rates in 1914 and 1915 were higher than for the average of the four years 1909-1912 before filtration, but the 1916 death rate was the lowest in any year from 1900-1916.
5. The ward distribution of cases in 1914-1916 shows 44 per cent attributed to the 2nd, 3rd, 4th and 5th wards which are partly supplied with water from the private company and the case records attribute 27 per cent of all infections during this time to the water furnished by this private company.
6. The facts point to the water furnished by this private company as the source of infection in 44 per cent of the total cases and 40 per of all deaths from January to June in these years.

7. The 1st, 6th, 9th and 12th wards contributed 31 per cent of the total cases in the years 1914-1916 and 44 per cent during the months of July-December.

8. Well water was used in 50 per cent of the households in the 6th, 9th and 12th wards where infections occurred in 1914-1916, and only slightly over half of these premises in the three wards were sewered, and only one out of three premises in the 12th ward.

The factors chiefly involved in the continued high prevalence of typhoid fever since filtered water was introduced, have been the water from the private company and the private well supplies, coupled with the several sources of infection operative in districts where shallow wells and privies abound. The reduction in the typhoid death rate which has been effected is due primarily to the elimination of the impure river water previously supplied by the city, and secondly to the decreased use of questionable well and other supplies, as faith in the city's filtered supply was increased. That there has not been further reduction in the typhoid death rate has been due principally to the operation of one factor, viz.: the water furnished by the private company, which has been impure at certain times up to May, 1916.

These statements well emphasize the fact that it has been the lack of use of the city filtered water, rather than its use, that has resulted in the small reduction in typhoid fever prevalence.

25. *Harbor Beach Water Supply:* The existence of several cases of typhoid fever at Harbor Beach during December, 1916, led to an investigation of the water supply, which developed the fact that the purity of the supply appears to be quite closely dependent upon the variation in the direction and intensity of the wind on Lake Huron. Our previous experience in matters of this kind in municipalities taking their water supply from the Great Lakes has led us to suspect that there might be a direct and important connection between the weather conditions and the purity of the water supply, and we were glad to be able to decide this definitely as a result of the Harbor Beach infection.

26. *Hillsdale Typhoid Fever Investigation:* During April, 1917, an outbreak of 13 cases of typhoid fever occurred in Hillsdale. A thorough investigation was made and a report drawn up which showed that the city water supply was the source of infection. The city authorities were advised to install a liquid chlorine sterilization plant for the city water and to establish a laboratory for the control of the process. These recommendations are being taken into consideration by the city.

27. *Ice Inspection:* The customary trip of inspections to the ice fields in the vicinity of Detroit was made during February, 1917. Eleven ice fields were inspected, ten samples collected and bacteriological examinations made. Only one sample showed the presence of B. Coli in such quantities as to render it unfit for use.

Inasmuch as the Detroit River is seriously polluted with sewage, ice cutting below the city was ordered discontinued by the State Board of Health. Similar action was taken with regard to Lake Orion, which has become polluted by being used as a summer resort.

28. *Lapeer, Michigan Home and Training School: Sewerage and Sewage Disposal:* Owing to various unfortunate circumstances at Lapeer, particularly the construction of new buildings, and a fire which de-

stroyed one of their old ones, work on the sewage treatment plant has been delayed, but construction is under way and it is hoped that an early completion will be realized.

29. Lowell Water Supply: The purchase of the local water supply at Lowell by the municipality caused the village authorities to request this department to make an inspection of the plant and to have the water tested. The results of the analysis showed that pollution was entering the suction main through defective joints where it crossed the river. The joints were repaired and subsequent tests showed that the danger had been eliminated. This circumstance is mentioned in the desire to call particular attention to the danger of pollution finding its way into a public water supply through a suction main surrounded with polluted water.

30. Manistique Water Supply: As the result of an inspection and recommendations made by this department the liquid chlorine process of water treatment has been installed at Manistique.

31. Menominee Water Supply: Construction was started on a rapid sand filtration plant on August 11, 1916, but due to various delays in construction it was not put into operation until June 18, 1917. Liquid chlorine was used during the period of construction. The operation is being studied and a conference has been held with the superintendent to discuss and outline methods of operation and laboratory control. A new and adequate laboratory is to be set up in the filter building to carry on the analyses necessary for the control of the operation. The new filter plant will unquestionably furnish to the citizens of Menominee a water of high sanitary quality at all times. The liquid chlorine machine will be kept in operation as a finishing process.

32. Midland Trade Waste Nuisance, Dow Chemical Co.: During the past winter numerous complaints reached this office regarding the tainting of fish caught in the Saginaw River, and in Saginaw Bay. Evidence was produced to show that the tastes and odors were so pronounced in the fish that they were unfit for sale. An investigation was carried on under the Public Domain Commission, in which representatives of the State Board of Health participated. The cause was traced to the chlorobenzol plant of the Dow Chemical Co.'s plant at Midland, and arrangements were made by the Company to prevent these wastes from reaching the river in future.

33. Monroe Water Supply: During the past year conferences have been held between the engineers of the Monroe Water Co. and the city with a view of determining an equitable schedule of rates to be allowed to be charged by the Company for water furnished its customers. This schedule is being worked out on the basis of a physical valuation of the plant and an accounting of the finances of the Company. Owing to various political complications no definite steps have been taken to obtain the approval of the voters for a new franchise embodying a revised schedule of rates which will permit the construction and operation of a filter plant.

34. Muskegon Heights, Tannery Waste Disposal: On August 26, 1916, a treatment plant for the wastes of the C. G. Fleckenstein Tannery was put into operation. The plant consists of an Imhoff tank and sand filters with discharge of the filter effluent into a small creek. Shortly after the completion of the plant the output of the tannery was almost doubled, and consequently the treatment works were taxed beyond their capacity. We learned that on account of the largely increased amount of wastes and the difficulties of operation the bypass was opened during the winter and the raw wastes allowed to flow into this small creek. This caused a nuisance in the creek with consequent complaint by riparian property owners. The matter was taken up with the Fleckenstein Company and they made arrangements to operate the plant more carefully and give it competent supervision. Some increase has been made in the size of the filter beds but no changes have been made to the tank. Inasmuch as the operation of the tannery is now more nearly normal and the plant being given more careful attention it is probable that it will give satisfactory service. Frequent visits of inspection are being made by representatives of this office and advice is being furnished the Company.

35. Muskegon Heights Sewerage and Sewage Disposal: Plans have been approved and construction is under way for a system of sanitary sewers with treatment plant at Muskegon Heights. The treatment plant will consist of sedimentation and contact filters, the contact effluent being treated on sand filters during warm weather or any other times when it may be found necessary.

36. Mt. Clemens, Bottled Water Industry: An inspection of the sources of the so-called bottled spring water from Mt. Clemens, sold in Detroit and other places, disclosed the fact that the water is mainly obtained from shallow wells instead of from springs as advertised. Samples collected from these wells showed that it was unsafe for drinking purposes. The matter was taken up with the State Dairy and Food Commissioner and the sale of these waters prohibited until such time as proper purification is installed.

37. Mt. Clemens, Selfridge Aviation Field, U. S. A.: A school of instruction for army aviators is being established at the mouth of the Clinton River on Lake St. Clair, near Mt. Clemens. Buildings to accommodate about 900 are rapidly nearing completion. These consist of barracks, mess halls, school, hospital, officers' quarters, shops and hangars for 72 aeroplanes. A complete sewer system is being built with sewage treatment by means of a septic tank and contact filters. The water supply will be pumped from Lake St. Clair and chlorinated. An emergency liquid chlorine machine has been loaned them pending the arrival of one to be ordered for permanent use.

38. Northville Sewerage: Plans have been approved for a system of sanitary sewers and treatment plant for the village of Northville, but owing to the high cost of material and labor it is not probable that this system will be constructed at once.

39. Pontiac, Pollution of Clinton River: During the summer of 1916 a number of property owners along the Clinton River below the city of Pontiac, combined, employed an attorney and threatened to bring suit against the city of Pontiac asking for an injunction to restrain the city of Pontiac from discharging crude sewage into the stream. At the request of the attorney for these people we made a careful examination of the conditions of the stream and gaugings of the flow of sewage and water in the river. The results of our measurements showed that on

September 5th there was less than four times as much water flowing in the stream as there was crude sewage discharged into it from the main outfall sewer. This amount of water, of course, is totally inadequate to dispose of sewage by dilution alone without the creation of an unbearable nuisance. The matter was brought to the attention of the City Commission with recommendation that immediate steps be taken for treating the sewage. After some discussion of the subject an engineer was employed by the city to make a report on the proper means of disposal and the estimate of cost. He has been subsequently authorized by the Commission to proceed with the final plans and specifications for construction so that the matter can be brought before the people for the authorization of a bond issue for the work.

40. Redford Sewerage: Plans for a system of sanitary sewers with a treatment plant, prepared for the village of Redford, have been approved by this office, but the proposition for bonding to defray the cost of the system was decisively defeated at the polls.

41. Resort Sanitation: During July and August, 1916, 103 summer resort inspections were made. Forty of these were made by the regular staff of the engineering division and 59 by temporary inspectors employed for that purpose. The general sanitary conditions of the resort may be termed fair. The most glaring defect observed at these summer resorts is the large number of poorly constructed and neglected outdoor closets. The disposal of garbage is also very unsatisfactory in a large number of cases. Garbage and refuse is generally dumped indiscriminately on the ground and even when buried the work is so imperfectly done that little if any beneficial results are obtained. Our experience in summer resort inspections has shown conclusively that the only way to obtain results commensurate with the time and money expended for this purpose is the maintenance of a patrol system whereby a resort may be visited several times during the season, and thus enforce the orders given.

42. Saginaw Sanitary Survey: Field work on this project was begun about February 1st, and completed during April, 1917, but the report has not yet been issued. The investigation included a study of the typhoid cases occurring during the previous year, laboratory examinations of the city water, and water from the municipal deep wells, and tests of as many of the private wells as seemed connected with any of the typhoid fever cases, or where the owner made a request for the tests. It also included a thorough investigation of depots, hotels and restaurants for the purpose of determining to what extent the city water is used for drinking and culinary purposes. This research showed that the city water on both sides of the river is unsafe for drinking purposes. Nine of the municipal deep wells were found after repeated bacteriological examinations to be unsafe for drinking purposes, and were so reported to the city officials. Many private shallow wells were found to be unsafe, and were condemned. The water supplies of some of the schools were found to be contaminated and so reported to the school authorities.

43. Sturgis Sewage Disposal: The horizontal flow stone filters at Sturgis became so clogged in the fall of 1916 that it was necessary to remove the stone, wash and screen it, and return the larger sizes to the filter beds. This was accomplished at considerable cost, but resulted in an improvement in the efficiency of the plant.

44. Tannery Waste Disposal: During the summer of 1916 an experimental plant embodying the activated sludge principal was installed at the plant of the Wallin Leather Co. at Mill Creek, north of Grand Rapids. On account of the difficulties of operation it was found necessary to discontinue the experiments during cold weather, but previous to that time enough had been learned of the possibilities of the process to justify the continuance of the experiments under proper weather conditions. Accordingly the plant has been much improved. A chemist has been employed by the Leather Company to supervise the operation of the experiments and make the necessary tests. By this means it is hoped to arrive at definite conclusions with respect to this process.

Respectfully submitted,
EDWARD D. RICH,
State Sanitary Engineer.

TABLE NO. 1.—*Municipalities whose question sheets on Public Water supply have been accepted to July 1, 1917.*

Addison*
Adrian (P)
Ahmeek*
Alanson*
Akron*
Albion
Algonac
Allegan
Alma
Almont
Alpena
Ann Arbor
Applegate*
Armada
Ashley*
Athens
Au Gres*
Augusta*
Au Sable*
Bad Axe
Baldwin*
Bangor
Baltic
Bancroft
Baraga
Baroda*
Barryton*
Battle Creek
Bay City
Bear Lake*
Beaverton
Belding
Bellaire (P)
Belleville
Bellevue*
Benton Harbor
Berrien Springs
Bessemer
Big Rapids
Birmingham
Blissfield*
Bloomingdale*
Boardman*
Boyne City
Breedsville*
Brighton*
Brimley*
Britton*
Bronson
Brooklyn*
Brown City
Buchanan
Buckley
Burlington*
Burr Oak*
Cadillac (P)
Caledonia*
Calumet Twp. (P)
Camden*
Capac
Carleton*
Caro (P)
Carson City
Carsonville
Caseville*
Casnovia*
Cass City
Cassopolis
Cedar Springs
Central Lake (P)
Centerville (P)
Charlevoix
Charlotte
Cheboygan
Chelsea
Chesaning
Clare
Clarkston*
Clayton*
Clifford*
Climax*
Clinton** (P)
Clio*
Coldwater
Coleman*
Colonia (P)
Colon*
Columbiaville (P)
Concord*
Constantine
Coopersville
Copemish*
Corunna
Croswell
Crystal Falls
Custer*
Daggett*
Dansville*
Davison*
Dearborn
Decatur
Deckerville*
Deerfield*
Detroit
Dexter*
Dimondale*
Douglas*
Dowagiac
Dryden*
Dundee*
Durand
Eagle*
East Grand Rapids
East Jordan
East Lake (P)
East Lansing
East Tawas
Eaton Rapids
Eau Claire*
Ecorse
Edmore
Edwardsburg*
Elberta*
Elk Rapids (P)
Elkton
Elsie*
Emmett*
Empire
Escanaba (P)
Essexville
Evart
Fairgrove*
Farmington
Farwell
Fennville
Fenton
Fife Lake*
Flint
Flushing
Ford (P)
Forestville*
Fountain*
Fowler**
Fowlerville
Frankenmuth*
Frankfort
Frazer*
Freeport*
Fremont
Fruitport*
Gagetown
Gaines*
Galesburg
Galien*
Garden*
Gaylord
Gladstone
Gobleville*
Grand Haven
Grand Ledge
Grand Rapids
Grand Rapids (Hydraulic Co.) (P)
Grandville
Grant*
Grass Lake*
Grayling (P)
Greenville
Grosse Pointe
Grosse Pointe Farms
Grosse Pointe Park
Grosse Pointe Shores
Hamtramck
Hancock
Hanover
Harbor Beach
Harbor Springs
Harrietta*
Harrison
Harrisville*
Hart
Hartford
Hastings
Hersey*
Highland Park
Hillman (P)
Hillsdale
Holland
Holly
Homer
Honor*
Houghton
Howard City
Howell
Hubbell
Hudson
Imlay City
Ionia
Iron Mountain (P)
Iron River
Ironwood (P)
Ishpeming
Ithaca
Jackson
Jonesville
Kalamazoo
Kalkaska
Kent City*
Kinde*
Kingsley
Kingston
Laingsburg*
Lake City
Lake Linden (P)
Lake Odessa
Lakeview*
L'Anse
Lansing
Lapeer
Laurium (P)
Lawrence
Lawton
Leonard*
Leroy*
Leslie
Lexington
Lincoln*
Linden*
Litchfield*
Lowell (P)
Ludington
Luther*
Lyons
Mackinaw City*
Mackinac Island
Mancelona
Manchester
Manistee
Manistique
Manton
Maple Rapids*
Marcellus
Marine City
Marion
Marlborough*
Marlette
Marquette
Marshall
Mason
Maybee*
Mayville
McBride*
Mecosta*
Melvin*
Memphis*
Mendon*
Menominee
Mesick
Metamora*
Middleville*
Midland
Mikado*
Milan
Milford
Millersburg*
Millington
Minden City*
Monroe (P)
Montague
Montgomery*
Montrose
Morenci
Morley*
Morrice*
Mt. Clemens
Mt. Morris*
Mt. Pleasant
Muir*
Mulliken*
Munising
Muskegon
Muskegon Heights
Nashville
Negaunee
Newaygo
New Baltimore
Newberry
New Buffalo*
New Haven*
Niles (P and M)
North Adams*
North Branch*
North Muskegon
Northport*
Northville
Norway
Oakley*
Oakwood
Olivet
Omer*
Onaway
Onekama*
Onsted*
Ontonagon
Orion
Ortonville*
Oscoda**
Otisville*
Otter Lake*
Ovid
Owendale*
Owosso
Oxford
Painsdale
Parma*
Paw Paw
Peck*
Pellston*
Pentwater
Perrinton*

TABLE NO. 1.—*Concluded.*

Perry
Petersburg*
Petoskey
Pewamo*
Pierson*
Pigeon
Pinckney*
Pinconning (P)
Plainwell
Plymouth
Pontiac
Port Austin
Port Hope*
Port Huron
Portland
Port Sanilac*
Posen*
Potterville*
Quincy
Reading
Redford
Reed City
Reese*
Richland*
Richmond
River Rouge
Rochester
Rockford
Rogers*
Romeo
Roscommon
Rose City*
Royal Oak
Saginaw
Saline
Sand Lake*
Sandusky
Saranac
Saugatuck
Sault Ste. Marie
Schoolcraft
Schoolcraft (Wayne Co.)
Scottville
Sebewaing*
Shelby
Shepherd
Sheridan
Sherman*
Sherwood*
Sibley Park (Wayne Co.)
South Haven
South Lyon*
South Range
Sparta (P)
Spring Lake
Springport*
Stambaugh
Standish***
Stanton
Stanwood*
St. Charles
St. Clair
St. Clair Heights
St. Ignace
St. Johns
St. Joseph
St. Louis
Stephenson*
Stevensville*
Sturgis
Sunfield*
Suttons Bay
Tawas City
Tecumseh
Tekonsha*
Thompsonville
Three Oaks (P)
Three Rivers
Tower*
Traverse City
Trenton
Tri-Mountain (P)
Tustin*
Twining
Ubly
Union City
Utica*
Vandalia*
Vassar
Vermontville*
Vernon*
Vicksburg
Wakefield
Waldron*
Walkerville*
Warren
Washington Heights (P)
Watervliet***
Wayland
Wayne
Webberville*
West Branch
Westlawn (Wayne Co.)
Westphalia*
Whitehall
White Pigeon*
Whittemore*
Wolverine
Woodland*
Wyandotte
Yale
Ypsilanti
Zeeland

Total...............431
Private............. 28
No system..........158

***Fire protection only.
**Not used for domestic purposes.
*No system.
(P) Privately owned.
§System contemplated.

TABLE NO. 2.—*Showing municipalities whose plans on Public Water supply have been accepted to July 1, 1917.*

Adrian
Algonac
Alma
Almont
Allegan
Ann Arbor
Alpena
Armada
Athens
Bad Axe
Baltic
Bangor
Battle Creek
Bay City
Beaverton
Belding
Bellaire
Benton Harbor
Berrien Springs
Bessemer
Big Rapids
Birmingham
Boyne City
Bronson
Brown City
Buchanan
Buckley
Cadillac
Caro
Carson City
Carsonville
Cass City
Cassopolis
Cedar Springs
Centerville
Charlevoix
Charlotte
Cheboygan
Chesaning
Chelsea
Clare
Coldwater
Coloma
Columbiaville
Constantine
Coopersville
Corunna
Croswell
Crystal Falls
Dearborn
Decatur
Deckerville
Detroit
Dowagiac
Durand
East Grand Rapids
East Jordan
East Lansing
East Tawas
Eaton Rapids
Ecorse
Edmore
Elk Rapids
Elkton
Empire
Escanaba
Essexville
Evart
Farmington
Farwell
Fennville
Fenton
Flint
Flushing
Ford
Fowlerville
Frankfort
Fremont
Gagetown
Galesburg
Gaylord
Gladstone
Grand Ledge
Grand Rapids
Grand Rapids Hydraulic Co.
Grandville
Grayling
Greenville
Grosse Pointe
Grosse Pointe Farms
Grosse Pointe Park
Grosse Pointe Shores
Hamtramck
Hancock
Hanover
Harbor Beach
Harbor Springs
Harrison
Hart
Hartford
Hastings
Highland Park
Hillman
Hillsdale
Holland
Holly
Homer
Houghton
Howard City
Howell
Hubbell
Hudson
Imlay City
Ionia
Iron Mountain
Iron River
Ishpeming
Ithaca
Jackson
Jonesville
Kalamazoo
Kalkaska
Kingsley
Kingston
Lake City
Lake Linden
Lake Odessa
Lansing
L'Anse
Lapeer
Laurium
Lawrence
Lawton
Leslie
Lowell
Ludington
Mackinac Island
Mancelona
Manchester
Manistee
Manistique
Manton
Marcellus
Marine City
Marion
Marlette
Marquette
Marshall
Mason
Mayville
McBain
Menominee
Mesick
Midland
Milan
Milford
Monroe
Montague
Morenci
Mt. Clemens
Mt. Pleasant
Munising
Muskegon
Muskegon Heights
Nashville
Negaunee
Newaygo
New Baltimore
Newberry
Niles
Northville
Norway
Oakwood
Olivet
Onaway
Ontonagon
Orion
Ovid
Owosso
Oxford
Painesdale
Paw Paw
Pentwater
Perry
Pigeon
Pinconning
Plainwell
Plymouth
Pontiac
Port Huron
Portland
Quincy
Reading
Redford
Reed City
Richmond
River Rouge
Rochester
Rockford
Romeo
Roscommon
Royal Oak
Saginaw
Saline
Sandusky
Saranac
Saugatuck
Schoolcraft
Schoolcraft (Wayne Co.)
Scottville
Shelby
Shepherd
Sibley Park (Wayne Co.)
South Haven
South Range
Sparta
Spring Lake
Stanton
St. Clair
St. Clair Heights
St. Ignace
St. Johns
St. Joseph
St. Louis
Sturgis
Suttons Bay
Tecumseh
Thompsonville
Three Oaks
Three Rivers
Traverse City
Trenton
Tri-Mountain
Ubly
Union City
Vassar
Vicksburg
Wakefield
Watervliet
Wayland
Wayne
West Branch
Westlawn (Wayne Co.)
Whitehall
Woodland
Wyandotte
Yale
Ypsilanti
Zeeland

Total...............249

TABLE NO. 3.—*Municipalites who have fully complied with Act 98, P. A. 1913, with regard to public water supply to July 1, 1917.*

Addison*
Adrian (P)
Ahmeek*
Akron*
Alanson*
Algonac
Allegan
Alma
Almont
Alpena
Ann Arbor
Applegate*
Armada
Ashley*
Athens
Au Gres*
Augusta*
Au Sable
Bad Axe
Baldwin*
Baltic
Bangor
Baroda*
Barryton*
Battle Creek
Bay City
Bear Lake*
Beaverton
Belding
Bellaire
Belleville*
Bellevue*
Benton Harbor
Berrien Springs
Bessemer
Big Rapids
Birmingham
Blissfield*
Bloomingdale*
Boardman*
Boyne City
Boyne Falls*
Breckenridge*
Breedsville*
Brighton*
Brimley*
Britton*
Bronson
Brooklyn*
Brown City
Buchanan
Buckley
Burlington*
Burr Oak*
Cadillac (P)
Caledonia*
Calumet Twp. (P)
Camden*
Carleton*
Caro (P)
Carson City
Carsonville
Caseville
Casnovia*
Cass City
Cassopolis
Cedar Springs
Centerville (P)
Charlotte
Charlevoix
Cheboygan
Chelsea
Chesaning
Clare
Clarkston*
Clayton*
Clifford*
Climax*
Clinton (P)
Clio*
Coldwater
Coleman
Coloma*
Colon*
Columbiaville
Concord*
Constantine
Coopersville
Copemish*
Corunna
Croswell
Crystal Falls
Custer*
Daggett*
Dansville*
Davison*
Dearborn
Decatur
Deckerville
Deerfield
Detroit
Dexter*
Dimondale*
Douglas*
Dowagiac
Dryden*
Dundee*
Durand
East Grand Rapids
Eagle*
East Jordan
East Lake (P)
East Lansing
Eaton Rapids
Eau Claire*
East Tawas
Ecorse
Edmore
Edwardsburg*
Elberta*
Elk Rapids (P)
Elsie*
Elkton
Emmett*
Empire
Escanaba
Essexville
Evart
Fairgrove
Farmington
Farwell
Fife Lake*
Flint
Flushing
Ford
Forestville*
Fountain*
Fowlerville
Frankenmuth*
Frankfort
Frazer*
Freeport*
Fremont
Gagetown
Gaines*
Galesburg
Galien*
Garden
Gaylord
Gladstone
Gobleville*
Grand Ledge
Grand Rapids
Grand Rapids Hydraulic Co
Grandville
Grant*
Grass Lake*
Grayling
Greenville
Grosse Pointe
Grosse Pointe Park
Grosse Pointe Farms
Grosse Pointe Shores
Hamtramck
Hancock
Hanover
Harbor Beach
Harbor Springs
Harrietta*
Harrison
Harrisville*
Hart
Hartford
Hastings
Hersey*
Highland Park
Hillman
Hillsdale
Holland
Holly
Homer
Honor*
Houghton
Howard City
Howell
Hubbell
Hudson
Imlay City
Ionia
Iron Mountain
Iron River
Ishpeming
Ithaca
Jackson
Jonesville
Kalamazoo
Kalkaska
Kent City*
Kinde*
Kingsley
Kingston
Laingsburg*
Lake City (P)
Lake Linden
Lake Odessa
Lakeview*
Lansing
L'Anse
Lapeer
Laurium
Lawrence
Lawton
Leonard*
Leroy*
Leslie
Lexington*
Lincoln*
Linden*
Litchfield*
Lowell
Ludington
Luther*
Lyons
Mackinaw City*
Mackinac Island
Mancelona
Manchester
Manistee
Manistique
Manton
Maple Rapids*
Marcellus
Marion
Marine City
Marlborough*
Marlette
Marquette
Marshall
Mason
Maybee*
Mayville
McBride*
Mecosta*
Melvin*
Memphis*
Mendon*
Menominee
Mesick
Metamora*
Middleville*
Mikado*
Milan
Milford
Millersburg*
Minden City*
Monroe
Montague
Montgomery*
Montrose*
Morenci
Morley*
Morrice*
Mt. Clemens
Mt. Morris*
Muir*
Mulliken*
Munising
Muskegon
Muskegon Heights
Nashville
Negaunee
Newaygo
New Baltimore
Newberry
New Buffalo*
New Haven*
Niles (P & M)
North Adams*
North Branch*
Northport*
Northville
Norway
Oakley*
Oakwood
Olivet
Omer*
Onaway
Onekama*
Onsted*
Ontonagon
Orion
Ortonville*
Oscoda*
Otisville*
Otter Lake*
Ovid
Owendale*
Owosso
Oxford
Painesdale (P)
Parma*
Paw Paw
Peck*
Pellston*
Pentwater
Perrinton*
Perry
Petersburg*
Pewamo*
Pierson*
Pigeon
Pinckney*
Pinconning
Plainwell
Plymouth
Pontiac
Port Hope*
Port Huron
Portland

TABLE NO. 3.—*Concluded.*

Port Sanilac*
Posen*
Pottervilie*
Quincy
Reading
Redford
Reed City
Reese*
Richland*
Richmond
River Rouge
Rochester
Rockford
Rogers*
Romeo
Roscommon
Rose City*
Royal Oak
Saginaw
Saline
Sand Lake*
Sandusky
Saugatuck
Saranac
Schoolcraft
Schoolcraft (Wayne Co.)
Scottville
Sebewaing*
Shelby
Shepherd
Sherman*
Sherwood*
Sibley Park (Wayne Co.)
South Haven
South Lyons*
South Range (P)
Sparta
Spring Lake
Springport*
Stanton
Stanwood*
Stephenson*
Stevensville*
St. Clair
St. Clair Heights
St. Ignace
St. Johns
St. Joseph
St. Louis
Sturgis
Sunfield*
Suttons Bay
Tawas City*
Tecumseh
Tekonsha*
Thompsonville
Three Oaks (P)
Three Rivers
Tustin*
Tower*
Traverse City
Trenton
Tri-Mountain (P)
Twining*
Ubly
Union City
Utica*
Vandalia*
Vassar
Vermontville*
Vernon*
Vicksburg
Wakefield
Waldron*
Walkerville*
Watervliet
Warren
Wayland
Washington Heights (P)
Wayne
Webberville*
West Branch
Westlawn
Westphalia*
Whitehall
White Pigeon*
Whittemore*
Wolverine*
Woodland*
Wyandotte
Yale
Ypsilanti
Zeeland

Total...............413
*No system.........158
(P) Private.

TABLE NO. 4.—*Municipalities whose question sheets on sewerage and sewage disposal have been accepted to July 1, 1917.*

Addison**
Adrian
Ahmeek
Akron
Alanson
Algonac
Allegan
Alma
Almont
Alpena
Ann Arbor
Applegate**
Armada
Ashley*
Athens*
Au Gres*
Augusta*
Baldwin*
Baltic
Bancroft**
Bangor (P)
Baraga
Baroda
Barryton
Battle Creek
Bay City
Bear Lake*
Beaverton
Belding
Bellaire*
Belleville
Bellevue
Benton Harbor
Benzonia*
Berrien Springs*
Bessemer
Big Rapids
Blissfield*
Bloomingdale
Boardman*
Boyne City
Boyne Falls*
Breckenridge*
Breedsville*
Brighton*
Brimley*
Britton*
Bronson**
Brooklyn**
Brown City
Buckley*
Burlington*
Burr Oak*
Byron**
Cadillac
Caledonia*
Camden*
Capac
Carleton*
Caro
Carson City
Carsonville
Caseville*
Cass City*
Cassopolis*
Cedar Springs*
Central Lake*
Centerville*
Charlevoix
Charlotte
Cheboygan
Chelsea
Chesaning
Clare
Clarkston*
Clayton*
Clifford**
Climax*
Clinton*
Clio*

Coldwater
Coleman**
Coloma
Colon (P)
Columbiaville*
Concord*
Constantine
Coopersville
Copemish*
Corunna
Croswell
Crystal Falls
Custer (P)
Daggett*
Dansville*
Davison
Decatur*
Deckerville
Detour*
Deerfield*
Detroit
Dexter*
Dimondale*
Douglas*
Dowagiac
Dryden*
Dundee
Durand
Eagle*
East Grand Rapids
East Jordan
East Lake*
East Lansing
East Tawas
Eaton Rapids
Eau Claire*
Ecorse
Edmore
Edwardsburg*
Elberta*
Elk Rapids
Elkton*
Elsie*
Empire*
Escanaba
Essexville
Evart
Fairgrove**
Farmington
Farwell
Fennville*
Fife Lake*
Flint
Flushing (P)
Ford
Forestville*
Fountain*
Fowler*
Fowlerville**
Frankfort
Frankenmuth**
Frazer**
Freeport*
Fremont
Fruitport (P)
Gagetown*
Gaines
Galesburg*
Galien*
Garden*
Gaylord*
Gladstone
Gobleville*
Grand Haven
Grand Ledge
Grand Rapids
Grandville*
Grant*
Grass Lake (P)
Grayling

Greenville
Grosse Pointe Farms
Grosse Pointe Shores
Hamtramck
Hancock
Hanover*
Harbor Springs
Harbor Beach
Harrietta*
Harrison*
Harrisville**
Hart
Hartford*
Hersey*
Highland Park
Hillman
Hillsdale
Holland
Holly
Honor*
Homer*
Houghton
Howard City
Howell
Hubbell
Hudson
Imlay City
Ionia
Iron Mountain
Iron River
Ironwood
Ishpeming
Jonesville
Kalamazoo
Kalkaska*
Kent City*
Kinde*
Kingsley**
Kingston*
L'Anse*
Laingsburg*
Lake City*
Lake Linden
Lake Odessa*
Lakeview*
Lansing
Lapeer
Laurium
Lawrence
Lawton**
Leonard**
Leroy*
Leslie
Lexington*
Lincoln*
Linden*
Litchfield*
Lowell
Ludington
Luther*
Lyons**
Mackinaw City*
Mackinac Island
Mancelona*
Manchester
Manistee
Manistique
Manton*
Maple Rapids*
Marcellus*
Marion (P)
Marine City
Marlborough*
Marlette
Marquette
Marshall
Mason
Maybee*
Mayville
McBain*

McBride*
Mecosta*
Melvin*
Memphis*
Mendon*
Menominee
Mesick*
Metamora*
Middleville*
Midland
Mikado*
Milan
Milford*
Millersburg**
Monroe
Montague*
Montgomery**
Montrose*
Morenci
Morley*
Morrice*
Mt. Clemens
Mt. Pleasant
Muir
Mt. Morris**
Mulliken*
Munising
Muskegon
Nashville
Negaunee
Newaygo
New Baltimore**
Newberry
New Buffalo**
New Haven*
Niles
North Adams (P)
North Branch
North Muskegon*
Northport (P)
Norway
Oakley*
Oakwood
Olivet*
Omer*
Onaway*
Onekama*
Onsted*
Ontonagon
Ortonville*
Oscoda (P)
Otisville*
Otsego
Otter Lake*
Ovid**
Owendale*
Owosso
Oxford*
Parma**
Painesdale (P)
Paw Paw
Peck*
Pellston*
Pentwater
Perrinton*
Perry*
Petersburg*
Petoskey
Pewamo*
Pierson*
Pigeon**
Pinckney*
Pinconning
Plainwell
Pontiac
Port Austin**
Port Hope
Port Huron
Portland
Port Sanilac*

TABLE NO. 4.—*Concluded.*

Posen*
Potterville*
Quincy*
Reading
Redford
Red Jacket
Reed City
Reese*
Richland*
Richmond
River Rouge
Rochester
Rockford
Rogers*
Romeo
Roscommon*
Rose City
Royal Oak
Saginaw
Saline
Sand Lake*
Sandusky
Saranac*
Saugatuck*
Schoolcraft*
Scottville
Sebewaing**
Shepherd
Shelby*
Sheridan**
Sherman*
Sherwood*
Sibley Park (Wayne Co.)
South Haven
South Lyon**
South Range
Sparta
Spring Lake
Springport*
Stambaugh
Standish
Stanton
Stanwood*
St. Charles*
St. Clair
St. Clair Heights
St. Ignace
St. Johns
St. Joseph
St. Louis
Stephenson*
Stevensville*
Sturgis
Sunfield*
Suttons Bay (P)
Tawas City*
Tecumseh
Tekonsha**
Thompsonville*
Three Oaks
Three Rivers
Tower*
Traverse City
Trenton
Tri-Mountain (P)
Tustin*
Twining*
Ubly**
Union City
Utica*
Vandalia*
Vanderbilt*
Vassar
Vermontville*
Vernon*
Vicksburg
Wakefield*
Waldron**
Walkerville**
Warren*
Washington Heights
Watervliet*
Wayland*
Wayne
Webberville
West Branch
Westphalia*
White Cloud*
Whitehall (P)
White Pigeon (P)
Whittemore*
Wolverine*
Woodland**
Wyandotte
Yale
Ypsilanti
Zeeland

Total................411
*No system.........174
**Storm sewers only.. 32
(P) Private sewers... 15

TABLE NO. 5.—*Showing municipalities whose maps and plans on sewerage and sewage disposal have been accepted to July 1, 1917.*

Adrian
Ahmeek
Allegan
Alanson
Algonac
Almont
Alpena
Armada
Baltic
Baroda
Battle Creek
Bay City
Beaverton
Belding
Belleville
Big Rapids
Bloomingdale
Boyne City
Brown City
Buchanan
Cadillac
Caro
Carson City
Carsonville
Charlevoix
Charlotte
Cheboygan
Chelsea
Clare
Coldwater
Constantine
Coopersville
Corunna
Croswell
Crystal Falls
Davison
Deckerville
Detroit
Dowagiac
Dundee
Durand
East Grand Rapids
East Jordan
East Lansing
East Tawas
Eaton Rapids
Ecorse
Edmore
Elk Rapids
Escanaba
Essexville
Evart
Farmington
Farwell
Fenton
Flint
Ford
Frankfort
Frazer
Fremont
Gaines
Gladstone
Grand Haven
Grand Ledge
Grand Rapids
Grayling
Grosse Pointe
Grosse Pointe Farms
Hamtramck
Hancock
Harbor Beach
Harbor Springs
Hart
Hastings
Highland Park
Hillman
Hillsdale
Holland
Houghton
Howard City
Howell
Hubbell
Hudson
Imlay City
Ionia
Iron Mountain
Iron River
Ironwood
Ishpeming
Ithaca
Jonesville
Kalamazoo
Lake Linden
Lake Odessa
Lansing
Lapeer
Laurium
Lawrence
Leslie
Lowell
Ludington
Mackinac Island
Manchester
Manistee
Manistique
Marine City
Marlette
Marquette
Marshall
Mason
Mayville
Menominee
Milan
Monroe
Morenci
Mt. Clemens
Mt. Pleasant
Munising
Muskegon
Nashville
Negaunee
Newaygo
New Baltimore
Newberry
Niles
North Branch
Northville
Norway
Oakwood
Ontonagon
Otsego
Owosso
Painesdale
Paw Paw
Pentwater
Petoskey
Pigeon
Pinconning
Plainwell
Pontiac
Port Hope
Port Huron
Portland
Reading
Redford
Red Jacket
Richmond
River Rouge
Rochester
Rockford
Romeo
Rose City
Saline
Sandusky
Scottville
Shepherd
Sibley Park (Wayne Co.)
South Haven
South Range
Sparta
Spring Lake
Stanton
St. Clair
St. Clair Heights
St. Ignace
St. Johns
St. Joseph
St. Louis
Sturgis
Tecumseh
Three Oaks
Three Rivers
Traverse City
Trenton
Tri-Mountain
Union City
Vassar
Vicksburg
Wayne
Webberville
West Branch
Wyandotte
Yale
Ypsilanti
Zeeland

Total...............185

TABLE NO. 6.—*Municipalities that have fully complied with Act 98, P. A. 1913, with regard to sewerage and sewage disposal to July 1, 1917.*

Addison**
Adrian
Ahmeek
Akron*
Alanson
Algonac
Allegan
Almont
Alpena
Applegate**
Armada
Ashley*
Athens*
Au Gres*
Augusta*
Baldwin*
Baltic
Bancroft**
Bangor
Baroda
Barryton*
Battle Creek
Bay City
Bear Lake*
Beaverton
Belding
Bellaire*
Belleville
Benzonia*
Berrien Springs*
Big Rapids
Blissfield*
Bloomingdale
Boardman
Boyne City
Boyne Falls*
Breckenridge*
Breedsville*
Brighton*
Brimley*
Britton*
Bronson**
Brooklyn**
Brown City
Buckley*
Burlington*
Burr Oak**
Byron**
Cadillac
Caledonia
Camden*
Carleton*
Caro
Carson City
Carsonville
Caseville*
Cass City*
Cassopolis*
Cedar Springs*
Central Lake*
Centreville*
Charlevoix
Charlotte
Cheboygan
Chelsea
Clare
Clarkston*
Clayton*
Clifford*
Climax*
Clio*
Coldwater
Coleman**
Coloma**
Colon*
Columbiaville*
Concord*
Constantine
Coopersville
Copemish*
Corunna
Croswell
Crystal Falls
Custer*
Daggett*
Dansville*
Davison
Decatur*
Deckerville
Deerfield*
Detour*
Detroit
Dexter*
Dimondale*
Douglas*
Dowagiac
Dryden*
Dundee
Durand
Eagle*
East Grand Rapids
East Jordan
East Lansing
East Tawas
Eaton Rapids
Eau Claire*
Ecorse
Edmore
Edwardsburg*
Elberta*
Elk Rapids
Elkton*
Elsie*
Empire*
Escanaba
Essexville
Evart
Fairgrove**
Farmington
Farwell
Fennville*
Fife Lake*
Flint
Flushing
Ford
Forestville*
Fountain*
Fowler*
Fowlerville**
Frankfort
Frankenmuth**
Frazer**
Freeport*
Fremont
Fruitport
Gagetown*
Gaines
Galesburg*
Galien*
Garden*
Gaylord*
Gladstone
Gobleville*
Grand Haven
Grand Ledge
Grand Rapids
Grandville*
Grant*
Grass Lake*
Grayling
Grosse Pointe
Grosse Pointe Farms
Grosse Pointe Shores
Hamtramck
Hancock
Hanover*
Harbor Beach
Harbor Springs
Harrietta*
Harrison*
Harrisville**
Hart
Hartford*
Hersey
Highland Park
Hillsdale
Hillman
Holland
Homer*
Honor*
Houghton
Howard City
Howell
Hubbell
Hudson
Ionia
Iron Mountain
Iron River
Ironwood
Ishpeming
Ithaca
Jonesville
Kalamazoo
Kalkaska*
Kent City*
Kinde*
Kingsley**
Kingston*
Laingsburg*
Lake City
Lake Linden
Lake Odessa*
Lakeview*
Lansing
Lapeer
Laurium
Lawrence
Lawton**
L'Anse*
Leroy*
Leslie
Lexington*
Lincoln*
Linden*
Litchfield*
Lowell
Ludington
Luther*
Lyons**
Mackinaw City*
Mackinac Island
Mancelona*
Manchester
Manistee
Manistique
Manton*
Maple Rapids*
Marcellus**
Marine City
Marion
Marlborough*
Marlette
Marquette
Marshall
Mason
Maybee*
Mayville
McBain*
McBride*
Mecosta
Melvin*
Memphis*
Mendon*
Menominee
Mesick*
Metamora*
Middleville*
Mikado*
Milan
Milford*
Millersburg**
Monroe
Montague*
Montgomery*
Montrose*
Morenci
Morley*
Morrice*
Mt. Clemens
Mt. Pleasant
Muir*
Mulliken*
Munising
Muskegon
Nashville
Negaunee
Newaygo
New Baltimore
Newberry
New Buffalo**
New Haven*
Niles
North Branch
North Muskegon*
Northport*
Norway
Oakley*
Oakwood
Olivet*
Omer*
Onaway
Onsted**
Ontonagon
Ortonville*
Oscoda
Otisville
Otsego
Otter Lake*
Ovid**
Owendale*
Owosso
Oxford*
Painesdale
Parma**
Paw Paw
Peck*
Pellston*
Pentwater
Perrinton*
Perry*
Petersburg*
Petoskey
Pewamo*
Pierson*
Pigeon**
Pinckney*
Pinconning
Plainwell
Pontiac
Port Austin**
Port Hope
Port Huron
Portland
Port Sanilac*
Posen*
Potterville*
Quincy*
Reading
Redford
Red Jacket
Reese*
Richland*

TABLE NO. 6.—*Concluded.*

Richmond
River Rouge
Rochester
Rockford
Rogers*
Romeo
Roscommon*
Rose City
Saline
Sand Lake*
Sandusky
Saranac
Saugatuck*
Schoolcraft*
Scottville
Sebewaing**
Shelby*
Shepherd
Sheridan**
Sherman*
Sherwood*
Sibley Park (Wayne Co.)
South Haven
South Lyons**
South Range
Sparta
Spring Lake
Springport*
Stanton
Stanwood*
St. Charles*
St. Clair
St. Clair Heights
St. Ignace
St. Johns
St. Joseph
St. Louis
Stephenson*
Stevensville*
Sturgis
Sunfield*
Suttons Bay*
Tawas City*
Tecumseh
Tekonsha**
Thompsonville*
Three Oaks
Three Rivers
Tower*
Traverse City
Trenton
Tri-Mountain
Tustin*
Twining*
Ubly**
Union City
Utica*
Vandalia*
Vanderbilt*
Vassar
Vermontville*
Vernon*
Vicksburg
Wakefield*
Waldron**
Walkerville**
Washington Heights
Watervliet*
Wayland*
Wayne
Webberville
West Branch
Westphalia*
White Cloud*
Whitehall*
White Pigeon*
Whittemore*
Wolverine*
Woodland**
Wyandotte
Yale
Ypsilanti
Zeeland

Total...............394
*No system.........171
**Storm water....... 32

TABLE NO. 7.—*Municipalities using Hypochlorite or Liquid Chlorine for treatment of their Public Water supply to July 1, 1917.*

HYPOCHLORITE.

Dearborn*
Escanaba*
Gladstone
Grand Rapids*
Ludington
Marine City
Munising
Negaunee
Norway
Port Huron**
South Haven
St. Clair
Wyandotte

Total...............13

LIQUID CHLORINE.

Adrian*
Alpena
Ann Arbor
Battle Creek
Bay City
Detroit
East Grand Rapids
Flint*
Grand Rapids
Hydraulic Co.
Highland Park
Grosse Pointe Farms
Manistique
Marquette
Menominee
Monroe
St. Joseph
Traverse City

Total...............17

*Adjunct to filtration.
**Liquid chlorine installed June 1, 1917.

Municipalities having filtration systems for purifying their public water supply to July 1, 1917:

Adrian
Dearborn
Escanaba
Flint
Grand Rapids
Ironwood
Menominee
Sibley

Total................8

TABLE NO. 8.—*Showing plans and specifications for State Buildings recommended for approval by the State Sanitary Engineer from June, 1916, to June 30, 1917.*

July 25, 1916.	Ypsilanti—Alterations to be made to the third floor of the Administration Building, State Normal School.
Nov. 11, 1916.	Ypsilanti—State Normal College, Administration Building.

TABLE NO. 9.—*Sanitary inspections and consultations June 30, 1916, to June 30, 1917.*

Location.	Date.	Subject.	Engineer.
Adrian	Oct. 24, 1916	Inspection of filtration plant	E. L. Waterman.
Alamo	July 20, 1916	Creamery wastes disposal	J. W. Follin.
Alamo	May 22, 1917	Creamery nuisance	F. G. Legg.
Albion	July 12, 1916	Conference with City Commission on sewers	F. G. Legg.
Albion	July 12, 1916	Sewerage	E. D. Rich.
Albion	Oct. 18, 1916	Submission of plans on water and sewer systems	F. G. Legg.
Albion	June 12, 1917	Sewerage nuisance and water supply	F. G. Legg.
Alden	Aug. 29, 1916	General sanitation	D. W. Bingham.
Alma	Sept. 11, 1916	Conference with city officials on water supply	F. G. Legg.
Alma	Jan. 17, 1917	Sewerage	F. G. Legg.
Alpha	Aug. 25, 1916	Plans for water supply	E. L. Waterman.
Anchorville	July 5, 1916	Summer resort sanitation	E. L. Waterman.
Ann Arbor	Sept. 20–29, 1916	Health survey	J. W. Follin.
Ann Arbor	Sept. 22, 23, 1916	Typhoid epidemic	E. D. Rich.
Ann Arbor	Sept. 29, 30, 1916	Sanitary survey	E. D. Rich.
Ann Arbor	Oct. 3–25, 1916	Health survey	J. W. Follin.
Ann Arbor	Oct. 21, 1916	Sanitary survey	E. D. Rich.
Ann Arbor	Nov. 1–7, 1916	Sanitary survey	J. W. Follin.
Ann Arbor	Jan. 8, 9, 10, 11	Health survey	J. W. Follin.
Ann Arbor	Jan. 9	Conference on sewage disposal	E. D. Rich.
Ann Arbor	Mar. 7	Sewage disposal (for Edison Co.)	E. D. Rich.
Ann Arbor	Apr. 26	Sewerage	E. D. Rich.
Ann Arbor	May 31	Sewage disposal	J. L. Crane.
Ann Arbor	June 27	Tannery wastes disposal	J. L. Crane.
Ann Arbor	June 27, 28	Miscellaneous	E. D. Rich.
Ann Arbor	June 28	Gauging current meter	D. W. Bingham.
Bad Axe	Aug. 25, 1916.	Sewerage and sewage disposal	D. W. Bingham.
Bad Axe	Mar. 29, 1917.	Sewerage and sewage disposal	D. W. Bingham.
Bancroft	July 28, 1916.	School house sewage disposal	F. G. Legg.
Bangor	Oct. 16	Inspection of nuisance on Kawkawlin River	E. L. Waterman.
Bath	June 23	Typhoid investigation	A. H. Jewell.
Bath	June 30	Typhoid investigation	A. H. Jewell.
Bath	June 30	Inspection of ice cream factory re Bath typhoid epidemic	A. H. Jewell.
Battle Creek	Sept. 12, 15	Pollution of the Kalamazoo River	J. W. Follin.
Battle Creek	Sept. 13, 14	Pollution of the Kalamazoo River	J. W. Follin.
Battle Creek	June 15, 23	Cantonment Camp U. S. A	D. W. Bingham.
Battle Creek	June 15	Camp sanitation, sewerage and water supply	E. D. Rich.
Battle Creek	June 25	Water supply	E. D. Rich.
Bay City	July 28, 29	Laboratory instruction	J. W. Follin.
Bay City	Oct. 5, 6	Resort inspection. Typhoid fever investigation	E. L. Waterman.
Bay City	Oct. 5, 6	Typhoid investigation	E. D. Rich.
Bay City	Oct. 11, 14	Typhoid investigation	E. L. Waterman.
Bay City	Nov. 1–7	Typhoid investigation	E. L. Waterman.
Bay City	Dec. 13, 14	Water supply	E. L. Waterman.
Bay City	Dec. 11	Conference with Leon Reynolds on typhoid	E. D. Rich.
Bay City	Dec. 13	River pollution	E. D. Rich.
Bay City	Dec. 14	Typhoid investigation	E. D. Rich.
Baw Beese Lake, (Hillsdale Co.)	July 22	Resort sanitation	F. G. Legg.
Belleville	May 9	Sewerage	F. G. Legg.
Benton Harbor	Aug. 23	Sewerage	J. W. Follin.
Benton Harbor	Aug. 23	Sewerage	F. G. Legg.
Benton Harbor	Jan. 31	Sewerage	F. G. Legg.
Beulah	July 19	Resort sanitation	D. W. Bingham.
Birmingham	May 2	Sewerage and sewage disposal	D. W. Bingham.
Birmingham	May 2	Conference at Lansing on sewage disposal for sub-division	E. L. Waterman.

TABLE NO. 9.—*Sanitary inspections.—Continued.*

Location.	Date.	Subject.	Engineer.
Boyne City	Aug. 28	Sewerage	D. W. Bingham.
Brighton	Feb. 1	Ice inspection	D. W. Bingham.
Bronson	Mar. 30	Conference at Lansing on general sanitation	F. G. Legg.
Brown City	Feb. 14	Conference at Lansing on sewerage	E. D. Rich.
Buchanan	Aug. 4	Sewage disposal	E. L. Waterman.
Buchanan	Oct. 6	Water maps and sewerage	D. W. Bingham.
Buchanan	Dec. 8	Conference with Mr. Toyne, of South Bend, on Buchanan sewerage	E. D. Rich.
Buchanan	Jan. 22	Conference at Lansing on sewerage	E. D. Rich.
Cadillac	Aug. 10, 11, 12	Water supply	E. D. Rich.
Cadillac	Oct. 23	Conference with Board of Supervisors on sewage disposal and water supply for proposed Tuberculosis Sanatorium	F. G. Legg.
Caro	Aug. 25	Sewage disposal	E. D. Rich.
Caro	Oct. 2	School house sanitation and sewage disposal	D. W. Bingham.
Cass Lake	Nov. 22	Sewerage and sewage disposal	D. W. Bingham.
Cassopolis	Jan. 30	Water supply	F. G. Legg.
Chelsea	Sept. 5	Conference with Village President and Village Attorney on water and sewer plans	F. G. Legg.
Chesaning	Nov. 16	Conference with Village President on water supply and sewage disposal	F. G. Legg.
Chesaning	Jan. 18	Submission of plans	F. G. Legg.
Clam Lake	Aug. 11	Resort sanitation	E. D. Rich.
Clark's Lake	Oct. 12	Nuisance	F. G. Legg.
Clio	Oct. 4	School house sewage disposal	E. L. Waterman.
Clio	Oct. 5	School house sewage disposal	E. D. Rich.
Coldwater	Oct. 14	Sewage disposal	F. G. Legg.
Coldwater	May 30	Water supply at State Public School	F. G. Legg.
Coldwater Lake	July 17	Resort sanitation	F. G. Legg.
Coloma	Sept. 11	Sewerage	J. W. Follin.
Coopersville	Aug. 1	Pollution of Deer Creek	J. W. Follin.
Corunna	June 29	Sewerage and sewage disposal	D. W. Bingham.
Crystal Lake, (Oceana Co.)	July 17	Resort sanitation	D. W. Bingham.
Crystal Lake, (Benzie Co.)	July 20	Resort sanitation	D. W. Bingham.
Crystal Lake	Nov. 2	Resort sanitation	E. D. Rich.
Dearborn	Oct. 16	Conference in Detroit on sewage disposal	E. L. Waterman.
Dearborn	Oct. 23	Sewerage	E. L. Waterman.
Dearborn	Mar. 21	Water supply	E. D. Rich.
Dearborn	Mar. 29	Water supply	E. D. Rich.
Decatur	July 21	Typhoid investigation	E. L. Waterman.
Decatur	July 25	Typhoid investigation	E. L. Waterman.
Decatur	Aug. 4, Sept. 29, Sept. 30	Typhoid investigation	E. L. Waterman.
Decatur	Oct. 5	Conference at Ann Arbor on typhoid and pollution of the Clinton River	D. W. Bingham.
Decatur	Sept. 29, 30	Typhoid investigation	D. W. Bingham.
Deerfield	Dec. 2	Conference with Village President on water supply and sewage disposal	F. G. Legg.
Detroit	July 1	Consultation on sub-division sewerage	E. L. Waterman.
Detroit	July 10	Consultation on sub-division sewerage	E. L. Waterman.
Detroit	July 19, 20	Sub-division sewerage	E. L. Waterman.
Detroit	July 26	Conference at Lansing with C. W. Hubbell, of Detroit, on sewers for sub-divisions	F. G. Legg.
Detroit	Sept. 20	Sewerage and sewage disposal	E. D. Rich.
Detroit	Sept. 22	Consultation with C. W. Hubbell on pollution of Clinton River	D. W. Bingham.
Detroit	Oct. 17	Oakman Blvd. sewage disposal	E. L. Waterman.
Detroit	Oct. 26	Sanitary district	E. D. Rich.
Detroit	Dec. 1	Sub-division sewage disposal	D. W. Bingham.
Detroit	Jan. 10	Conference on sewage disposal	E. D. Rich.
Detroit	Jan. 15	Sewerage	E. D. Rich.
Detroit	Jan. 25	Conference at Board of Commerce on general sanitation	E. D. Rich.
Detroit	Feb. 7	Ice inspection	D. W. Bingham.
Detroit	Feb. 20	Conference at Lansing on Detroit sub-division sewerage	E. D. Rich.

TABLE NO. 9.—*Sanitary inspections.—Continued.*

Location.	Date.	Subject.	Engineer.
Detroit	Mar. 10	Water supply	E. L. Waterman.
Detroit	Mar. 21	Conference at Lansing on general sanitation for Detroit	E. D. Rich.
Detroit	Mar. 30	Sewage disposal for sub-division	E. L. Waterman.
Detroit	Mar. 31	Conference with City Engineer	E. L. Waterman.
Detroit	Apr. 20	Sewerage	E. D. Rich.
Detroit	Apr. 21	Conference on water supply	E. L. Waterman.
Detroit	Apr. 23,24	General sanitation	E. L. Waterman.
Detroit	Apr. 27	Sewerage	E. D. Rich.
Detroit	May 3	Conference at Lansing on sewage disposal at Cross Country Riding Club	E. L. Waterman.
Detroit	May 29	Conference at Lansing with Dr. Clawson on sub-division sanitary matters	F. G. Legg.
Detroit	June 15,16	Sewage disposal at St. Francis Home	E. L. Waterman.
Devils Lake, (Lenawee Co.)	July 20	Resort sanitation	F. G. Legg.
Drayton Plains	Feb. 6	Ice inspection	D. W. Bingham.
Dundee	Oct. 24	Water supply and sewerage	D. W. Bingham.
Dundee	Mar. 6	Water supply	F. G. Legg.
Durand	Aug. 29	Sewage disposal	E. D. Rich.
Durand	Oct. 6	Sewage disposal plant	E. L. Waterman.
Durand	Oct. 4	Sewage disposal	E. D. Rich.
Durand	Oct. 12	Sewage disposal	D. W. Bingham.
Durand	Oct. 12	Sewage disposal	E. D. Rich.
East Gd. Rapids.	Nov. 10	Sewage disposal	J. W. Follin.
East Gd. Gapids.	Nov. 10	Sewage disposal	E. D. Rich.
East Gd. Rapids.	Dec. 7	Inspection of sewage disposal	F. G. Legg.
East Lansing	Aug. 9	Polluted water supply	F. G. Legg.
East Lansing	Mar. 19	Address at M. A. C	D. W. Bingham.
East Tawas	Apr. 3	Water supply	J. L. Crane.
East Tawas	Aug. 18	Proposed changes in water system and purity of water	F. G. Legg.
Eaton Rapids	July 13	Inspection of nuisance	E. L. Waterman.
Ecorse	Feb. 3	Ice inspection	D. W. Bingham.
Ecorse	June 4	Conference at Lansing on Ecorse sewers	D. W. Bingham.
Edmore	Aug. 1	Sewage nuisance	F. G. Legg.
Elberta	July 19	Resort sanitation	D. W. Bingham.
Elk Lake	Aug. 9	Resort sanitation	D. W. Bingham.
Elk Rapids	Aug. 9	Purity of water	D. W. Bingham.
Epworth Hts.	Aug. 23	Inspection of sewage disposal	J. W. Follin.
Escanaba	July 28	Water supply	E. D. Rich.
Escanaba	Aug. 15	Water supply and sewage disposal	E. L. Waterman.
Fairhaven	Jan. 31	Ice inspection	D. W. Bingham.
Flat Rock	Feb. 28	Conference at Detroit—sewage	E. L. Waterman.
Flint	July 26,27	Pollution of Flint River	J. W. Follin.
Flint	Oct. 4	Water purification	E. D. Rich.
Flint	Oct. 4	Filtration plant	E. L. Waterman.
Flint	Dec. 6	Conference with Mr. Leopold, of Pittsburg, on water purification	E. L. Waterman.
Flint	Feb. 28	Water supply	E. L. Waterman.
Flushing	July 26,27	Pollution of Flint River	J. W. Follin.
Ford	Jan. 16	Sanitary survey	E. L. Waterman.
Ford	May 1	Conference in Detroit on sewerage and sewage disposal	D. W. Bingham.
Ford	May 3	Sewerage and sewage disposal	D. W. Bingham.
Ford	June 26	General sanitation	E. L. Waterman.
Ford Republic	Nov. 22	Sewerage and sewage disposal	D. W. Bingham.
Frankfort	July 20	Submission of maps	D. W. Bingham.
Fremont	Feb. 16	Conference in Lansing on sewerage	E. D. Rich.
Fremont	Apr. 25	Canning factory wastes disposal	J. L. Crane.
French Landing	Oct. 21	Garbage reduction	E. D. Rich.
Gladstone	Aug. 14	Water supply	E. L. Waterman.
Gladstone	Oct. 19	Conference with S. A. Greeley, of Chicago, on sewerage	E. D. Rich.
Grand Ledge	Sept. 8	River pollution	E. D. Rich.
Grand Rapids	July 3–7	Typhoid investigation	J. W. Follin.
Grand Rapids	Oct. 16	Tannery wastes disposal	J. W. Follin.
Grand Rapids	Oct. 29,30	Tannery wastes disposal	J. W. Follin.

TABLE NO. 9.—*Sanitary inspections.—Continued.*

Location.	Date.	Subject.	Engineer.
Grand Rapids	Nov. 9–11	Tannery wastes disposal	J. W. Follin.
Grand Rapids	Dec. 1	Tannery wastes disposal	J. W. Follin.
Grand Rapids	Dec. 15–18	Tannery wastes disposal	J. W. Follin.
Grand Rapids	Jan. 5, 6	Tannery wastes disposal	J. W. Follin.
Grand Rapids	Jan. 27, 29	Typhoid investigation	J. W. Follin.
Grand Rapids	Apr. 24	Tannery wastes disposal	J. L. Crane.
Grand Rapids	Apr. 24	Trade wastes disposal	E. D. Rich.
Grand Rapids	May 5	Tannery wastes disposal	J. L. Crane.
Grand Rapids	May 23	Tannery wastes disposal	J. L. Crane.
Grand Rapids	June 2, 3	Tannery wastes disposal	J. L. Crane.
Grand Rapids	June 5, 6	Tannery wastes disposal	J. L. Crane.
Grand Rapids	June 13	Tannery wastes disposal	J. L. Crane.
Grandville	Aug. 9	Water supply	J. W. Follin.
Glenn Lake, (Benzie Co.)	July 20	Resort sanitation	D. W. Bingham.
Grass Lake, (Antrim Co.)	Aug. 7	Resort sanitation	D. W. Bingham.
Grosse Pointe	May 1	Conference at Detroit on sewerage and sewage disposal	D. W. Bingham.
Grosse Pt. Twp.	Sept. 25	Conference at Detroit on water supply for portion of Grosse Pointe Township	D. W. Bingham.
Hamlin Lake	July 24	Resort sanitation	D. W. Bingham.
Harbor Beach	Aug. 24	Sewerage and sewage disposal and resort sanitation	D. W. Bingham.
Harbor Beach	Dec. 14	Typhoid investigation	D. W. Bingham.
Harbor Beach	Mar. 28, 29	Water supply and sewage disposal	D. W. Bingham.
Harbor Springs	July 31	Nuisance	D. W. Bingham.
Hastings	Oct. 18	Sewage disposal	F. G. Legg.
Hastings	Nov. 6	Conference with Geo. Burgess on sewer plans.	F. G. Legg.
Helena Twp.	Aug. 10	Resort sanitation	D. W. Bingham.
Highland Park	July 20	Inspection of nuisance	E. L. Waterman.
Highland Park	Aug. 25	Conference at Lansing with Dr. Martin, H. O., on sewage nuisance	F. G. Legg.
Highland Park	Apr. 25	Laboratory inspection	E. L. Waterman.
Highland Park	Jan. 10	Sewerage	E. D. Rich.
Highland Park	Feb. 5	Laboratory inspection	E. L. Waterman.
Hillsdale	Sept. 25	Water supply and sewage disposal	E. D. Rich.
Hillsdale	Apr. 26–30	Typhoid investigation	J. L. Crane.
Hillsdale	May 21	Sewage disposal at County Infirmary	F. G. Legg.
Holland	Dec. 8	Conference with Supt. of Public Works on harbor pollution and purity of the city water supply	F. G. Legg.
Hubbardston	Nov. 3	School sewerage	E. D. Rich.
Hubbardston	Oct. 16	Conference at Detroit on sewage disposal	E. L. Waterman.
Imlay City	Aug. 28	Sewage disposal	E. D. Rich.
Imlay City	Nov. 2	Sewerage and sewage disposal	D. W. Bingham.
Imlay City	Nov. 10	Sewerage and sewage disposal	D. W. Bingham.
Ionia	Sept. 9	Purity of water supply	F. G. Legg.
Ironwood	Aug. 24	Water supply	E. L. Waterman.
Island Lake	Feb. 1	Ice inspection	D. W. Bingham.
Ithaca	Aug. 23	Sewage disposal	E. D. Rich.
Ithaca	Sept. 12	Sewage disposal	D. W. Bingham.
Ithaca	Oct. 6	Inspection of sewage disposal plant	E. L. Waterman.
Jackson	Sept. 19	Prison well pollution	F. G. Legg.
Jackson	Sept. 27	Prison well pollution	F. G. Legg.
Jackson	Oct. 10	Prison well pollution	F. G. Legg.
Kawkawlin	Sept. 12	Sewage and drainage nuisance	F. G. Legg.
Keeler Center	July 8	Inspection of slaughter house	J. W. Follin.
Kent City	Aug. 8	School house sewage disposal	J. W. Follin.
Kent County	Nov. 10	Sewage disposal at Kent County Poor Farm	E. D. Rich.
Kent County	Nov. 10	Sewage disposal at Kent County Poor Farm	J. W. Follin.
Klingers Lake, (St. Joseph Co.)	July 18	Resort sanitation	F. G. Legg.
Lake City	Dec. 14	Water supply investigation	J. W. Follin.

TABLE NO. 9.—*Sanitary inspections.—Continued.*

Location.	Date.	Subject.	Engineer.
Lake Harbor	July 14	Resort sanitation	D. W. Bingham.
Lake Mich. Park	July 15	Resort sanitation	D. W. Bingham.
Lake Odessa	Feb. 1	Creamery wastes disposal	F. G. Legg.
Lakeview	July 31	Vinery nuisance and sewage disposal	F. G. Legg.
Lansing	Aug. 9	Conference with Mr. Brown and Mr. Oakley on sewage disposal at "Espanore"	F. G. Legg.
Lansing	Aug. 12	Inspection of proposed sewage disposal at "Espanore"	F. G. Legg.
Lansing	Aug. 22, 23	Typhoid investigation	F. G. Legg.
Lansing	Aug. 28	Conference with Mr. T. G. Porter on sewage disposal for new addition outside of Lansing	F. G. Legg.
Lansing	Aug. 28	Conference on sewerage for Greencroft subdivision	F. G. Legg.
Lansing	Oct. 2	Conference with Mr. Dirr on Logan street sewer	F. G. Legg.
Lansing	Oct. 9	Address before City Council on sewerage	E. D. Rich.
Lansing	Nov. 6	Conference with Pattengill & Foster on sewage disposal for sub-division	F. G. Legg.
Lapeer	Aug. 28	Sewage disposal	E. D. Rich.
Lapeer	Oct. 5	Michigan Home and Training School	F. G. Legg.
Lapeer	Nov. 2	Sewage disposal at Michigan Home and Training School	F. G. Legg.
Lapeer	Dec. 19	Conference with County Surveyor on proposed sewage treatment at the County Infirmary	F. G. Legg.
Lapeer	Dec. 19	Inspection of source of city's ice supply	F. G. Legg.
Lapeer	Mar. 7	Sewage disposal at the Michigan Home and Training School	F. G. Legg.
Lapeer	Apr. 26	Sewage disposal at the Michigan Home and Training School	F. G. Legg.
Lapeer	June 13, 14	Sewage disposal at the Michigan Home and Training School	F. G. Legg.
Lapeer	June 18–22	Sewage disposal at the Michigan Home and Training School	F. G. Legg.
Lapeer	June 27, 28	Sewage disposal at the Michigan Home and Training School	F. G. Legg.
Litchfield	Dec. 2	Conference with Village President regarding water supply and sewage disposal	F. G. Legg.
Lowell	Apr. 27	Water supply	E. L. Waterman.
Lowell	June 20	Water supply	A. H. Jewell.
Ludington	July 18	Water purification	D. W. Bingham.
Ludington	Aug. 21, 22	Pollution of harbor and laboratory instruction	J. W. Follin.
Ludington	Apr. 3	Typhoid investigation	F. G. Legg.
Mackinaw City	Aug. 2	Nuisance and resort sanitation	D. W. Bingham.
Mackinaw City	June 29	Railroad water supply	E. L. Waterman.
Mackinac Island	Aug. 3, 4	Test on garbage incinerator	D. W. Bingham.
Mackinac Island	Sept. 2–5	Sanitary inspection	J. W. Follin.
Manistique	Aug. 26, 28	Water supply	E. L. Waterman.
Manistique	May 14	Conference in Lansing with City Clerk on water supply	E. D. Rich.
Manistique	June 20	Water supply	J. L. Crane.
Marble Lake, (Branch Co.)	July 19	Resort sanitation	F. G. Legg.
Marine City	Dec. 20	Typhoid investigation	F. G. Legg.
Marine City	Feb. 6	Water supply	E. L. Waterman.
Marine City	Mar. 13	Water supply	E. L. Waterman.
Marine City	Mar. 15	Water supply	E. L. Waterman.
Marquette	July 24, 25, 26	Sewerage	E. D. Rich.
Marquette	Apr. 21, 22	Laboratory instruction	E. L. Waterman.
Mayville	Sept. 6	Conference at Lansing with Geo. B. Fuller, Village Engineer, on the existing water and sewer systems	F. G. Legg.
Menominee	Aug. 11, 12	Laboratory instruction, sewage and garbage disposal	E. L. Waterman.
Menominee	July 21, 22, 23	Water filtration plant	J. L. Crane.

TABLE NO. 9.—*Sanitary inspections.—Continued.*

Location.	Date.	Subject.	Engineer.
Michigan Center, (Jackson)	Aug. 31	Resort sanitation	F. G. Legg.
Michigan Center.	June 25	Drainage	A. H. Jewell.
Midland	July 31	Sanitary inspection	J. W. Follin.
Midland	Mar. 9	Trade wastes disposal at Dow Chemical Co	D. W. Bingham.
Midland	Mar. 13	Trade wastes disposal at Dow Chemical Co	D. W. Bingham.
Midland	Mar. 21	Trade wastes disposal at Dow Chemical Co	D. W. Bingham.
Midland	Mar. 30	Trade wastes disposal at Dow Chemical Co	D. W. Bingham.
Midland	Apr. 4	Trade wastes disposal	D. W. Bingham.
Midland	Apr. 23	Water supply and construction of filter plant	D. W. Bingham.
Midland	Apr. 23	Water supply	F. G. Legg.
Midland	May 4	Conference at Lansing on water filtration	D. W. Bingham.
Mill Creek	July 17–27	Tannery wastes disposal	J. W. Follin.
Mill Creek	Aug. 7–14	Tannery wastes disposal	J. W. Follin.
Mill Creek	Aug. 19	Tannery wastes disposal	J. W. Follin.
Mill Creek	Aug. 28	Tannery wastes disposal	J. W. Follin.
Mill Creek	Aug. 31, Sep. 1	Tannery wastes disposal	J. W. Follin.
Mill Creek	Sept. 7	Tannery wastes disposal	J. W. Follin.
Mill Creek	Sept. 7	Tannery wastes disposal	J. W. Follin.
Mill Creek	Sept. 11	Tannery wastes disposal	J. W. Follin.
Mill Creek	Sept. 18, 19, 30	Tannery wastes disposal	J. W. Follin.
Mill Creek	Nov. 9	Tannery wastes disposal	J. W. Follin.
Mona Lake	July 15	Resort sanitation	D. W. Bingham.
Monroe	July 2	Laboratory instruction	J. W. Follin.
Monroe	Aug. 23	Resort sanitation	D. W. Bingham.
Monroe	Jan. 1, 2	Water supply	J. W. Follin.
Monroe	Mar. 1–3	Typhoid investigation	E. L. Waterman.
Monroe	Mar. 7	Conference at Ann Arbor on water supply and sewerage for Monroe	E. D. Rich.
Monroe	Apr. 19	Conference at Lansing with Attorney Thornton Dixon, of Monroe, on water supply	E. D. Rich.
Monroe	June 25, 26	Water supply	E. L. Waterman.
Monroe	June 30	Conference at Ann Arbor on Monroe water supply	E. L. Waterman.
Morrison Lake, (Branch Co.)	July 19	Resort sanitation	F. G. Legg.
Mt. Clemens	Nov. 23	Location of private water supply	D. W. Bingham.
Mt. Clemens	Aug. 18	Purity of water supply	D. W. Bingham.
Mt. Clemens	Aug. 21	Purity of water supply	D. W. Bingham.
Mt. Pleasant	Aug. 2	School house sewage disposal	F. G. Legg.
Munising	Aug. 16–19	Typhoid investigation	E. L. Waterman.
Muskegon Hts	Aug. 31	Inspection of tannery wastes disposal plant	J. W. Follin.
Muskegon Hts	Nov. 9	Water supply and tannery wastes disposal	J. W. Follin.
Muskegon Hts	Nov. 9	Water supply and tannery wastes disposal	E. D. Rich.
Muskegon Hts	Apr. 25	Trade wastes disposal	E. D. Rich.
Negaunee	July 27	Sewerage	E. D. Rich.
Negaunee	Aug. 23	Laboratory instruction	E. L. Waterman.
Negaunee	Feb. 28	Sewerage conference in Lansing	E. D. Rich.
Newberry	Mar. 7	Conference at Ann Arbor on sewage disposal	E. D. Rich.
North Branch	Aug. 28	Sewage disposal	E. D. Rich.
North Detroit	Oct. 28	Sewage disposal at Deaf Mute School	E. L. Waterman.
Northville	Oct. 16	Conference at Detroit on sewage disposal	E. L. Waterman.
Northville	Oct. 30	Sewerage	E. L. Waterman.
Northville	Oct. 26	Conference with C. W. Hubbell on sewerage	E. D. Rich.
Northville	Nov. 23	Conference with C. W. Hubbell at Detroit on Northville sewerage	D. W. Bingham.
Northville	Jan. 3	Conference in Detroit on sewerage	E. L. Waterman.
Northville	Apr. 21	Conference in Detroit on sewerage	E. L. Waterman.
Northville	Apr. 27	Sewerage	E. D. Rich.
Northwood	July 2	Conference with Dr. Clawson on sewerage for Northwood sub-division	F. G. Legg.
Oden	Aug. 1	Nuisance	D. W. Bingham.
Orchard Lake	July 21	General sanitation	E. L. Waterman.
Orchard Lake	July 26	Nuisance	E. L. Waterman.
Oakwood	Aug. 15	River pollution by rendering works	F. G. Legg.
Orion	Sept. 1	Resort Sanitation	E. D. Rich.
Orion	Sept. 13	Conference with village officials regarding the lowering of lake and sewage disposal for Park Island	F. G. Legg.

TABLE NO. 9.—*Sanitary inspections.—Continued.*

Location.	Date.	Subject.	Engineer.
Orion	Feb. 5	Ice inspection	D. W. Bingham.
Orion	Mar. 9	Nuisance	D. W. Bingham.
Orion	May 1	Conference at Detroit on sewage disposal for Grace Cottage	D. W. Bingham.
Orion	June 7	Conference in Detroit on garbage disposal	D. W. Bingham.
Orion	June 8	Sewerage and sewage disposal	D. W. Bingham.
Otsego	Aug. 2	Water supply	J. W. Follin.
Otsego	Sept. 7	Conference at Lansing with M. C. Taft on proposed sewers	F. G. Legg.
Peninsular Twp., (Gd. Traverse County)	July 23	Resort sanitation	D. W. Bingham.
Petoskey	Aug. 5	Sewage disposal	D. W. Bingham.
Petoskey	Aug. 8	Purity of water supply	D. W. Bingham.
Petoskey	Feb. 15	Conference at Lansing on sewerage	E. D. Rich.
Pine Lake	July 3	Summer resort sanitation	E. L. Waterman.
Plainwell	Oct. 17	Water supply and sewage disposal	F. G. Legg.
Plainwell	Feb. 14	Conference at Lansing on sewerage	E. D. Rich.
Plymouth	June 1	Conference at Lansing with Kinney & Wilcox school house sanitation	E. D. Rich.
Plymouth	May 8	Sewerage	F. G. Legg.
Plymouth	June 6	Sewerage	E. D. Rich.
Plymouth	Mar. 6	Conference at Ann Arbor on sewage disposal	E. D. Rich.
Pontiac	Aug. 1	Nuisance at Seminary	E. D. Rich.
Pontiac	Aug. 22	Typhoid investigation	D. W. Bingham.
Pontiac	Sept. 1	Pollution of Clinton River	E. D. Rich.
Pontiac	Sept. 5	Pollution of Clinton River	E. D. Rich.
Pontiac	Sept. 5,6,7,8	Pollution of Clinton River	D. W. Bingham.
Pontiac	Sept. 13	Pollution of Clinton River	D. W. Bingham.
Pontiac	Sept. 5,6	River gauging	E. L. Waterman.
Pontiac	Sept. 14	Sewage disposal	E. L. Waterman.
Pontiac	Sept. 27	Pollution of Clinton River	D. W. Bingham.
Pontiac	Nov. 16	Stream gauging on Clinton River	E. L. Waterman.
Pontiac	Nov. 16	Stream gauging	D. W. Bingham.
Pontiac	Nov. 22	Sewage disposal	D. W. Bingham.
Provemont	July 21	Resort sanitation	D. W. Bingham.
Port Huron	Nov. 13–15	Laboratory inspection	E. L. Waterman.
Port Huron	Dec. 4	Inspection of sites for County Sanatorium	E. L. Waterman.
Port Huron	Feb. 6	Laboratory inspection	E. L. Waterman.
Port Huron	Mar. 12	Water supply	E. L. Waterman.
Redford	Sept. 19	Sewerage and sewage disposal	E. D. Rich.
Redford	Feb. 16,17	Water supply	E. L. Waterman.
Redford	Feb. 20	Conference in Lansing on water supply	D. W. Bingham.
Redford	Apr. 21	Water supply	E. L. Waterman.
Redford	Feb. 21	Conference in Lansing on water supply	E. D. Rich.
Redford	Mar. 2	Conference in Lansing on water supply	E. D. Rich.
Reed City	Dec. 6	Inspection of sewage disposal works	F. G. Legg.
Richmond	Aug. 21	Sewerage	D. W. Bingham.
Round Lake, (Lenawee Co.)	July 21	Resort sanitation	F. G. Legg.
Round Lake, (Jackson Co.)	July 24	Resort sanitation	F. G. Legg.
Royal Oak	Aug. 16	Conference with Health Officer on sewage disposal for sub-division	F. G. Legg.
Royal Oak	June 27	Sewerage	E. L. Waterman.
Royal Oak	June 27	Sewerage at Water Works Park sub-division	E. L. Waterman.
Saginaw	Oct. 28	Drains	E. D. Rich.
Saginaw	Oct. 28	Meeting Saginaw Eng. Soc	E. D. Rich.
Saginaw	Jan. 3	Conference in Lansing on river pollution	E. D. Rich.
Saginaw	Jan. 16	Sanitary survey	E. D. Rich.
Saginaw	Jan. 17,18	Meeting Mich. Eng. Soc	E. D. Rich.
Saginaw	Jan. 16,17	Meeting Mich. Eng. Soc	D. W. Bingham.
Saginaw	Jan. 8	Conference with City Engineer on sanitary survey	D. W. Bingham.
Saginaw	Jan. 16,17	Meeting Mich. Eng. Soc	J. W. Follin.
Saginaw	Jan. 16,18	Sanitary survey	E. L. Waterman.

TABLE NO. 9.—*Sanitary inspections.—Continued.*

Location.	Date.	Subject.	Engineer.
Saginaw	Feb. 3	Sanitary survey	E. D. Rich.
Saginaw	Feb. 7,8	Sanitary survey	E. D. Rich.
Saginaw	Feb. 9	Sanitary survey	E. L. Waterman.
Saginaw	Feb. 21,27	Sanitary survey	E. L. Waterman.
Saginaw	Feb. 23,24	Sanitary survey	E. D. Rich.
Saginaw	Feb. 26 to Mar. 16	Sanitary survey	D. W. Bingham.
Saginaw	Feb. 3 to Apr. 1	Sanitary survey	J. L. Crane.
Saginaw	Mar. 8	Conference with Game Warden Baird on Saginaw River pollution by Dow Chemical Co.	D. W. Bingham.
Saginaw	Mar. 14	Sanitary survey	E. L. Waterman.
Saginaw	Mar. 20–27	Sanitary survey	D. W. Bingham.
Saginaw	Mar. 30–31	Sanitary survey	D. W. Bingham.
Saginaw	Apr. 1,2	Sanitary survey	J. L. Crane.
Saginaw	Apr. 4	Sanitary survey	D. W. Bingham.
Saginaw	Apr. 4 to May 4	Sanitary survey	F. G. Legg.
Saginaw	Apr. 7–9	Sanitary survey	E .L. Waterman.
Saginaw	Apr. 4–20	Sanitary survey	J. L. Crane.
Saginaw	Apr. 21	Conference on proposed water supply	D. W. Bingham.
Saginaw	May 2,3,4	Sanitary survey	J. L. Crane.
Saugatuck	July 25	Resort sanitation	F. G. Legg.
Shelby	July 18	Submission of maps	D. W. Bingham.
Sibley	Feb. 3	Inspection of filter plant at quarry of Solvay Process Co	E. L. Waterman.
Sibley	Apr. 20	Water supply at quarry of Solvay Process Co.	E. L. Waterman.
Sibley Park	Sept. 23	Conference at Detroit with C. F. Liddle on sewerage and sewage disposal	D. W. Bingham.
Sibley Park	Jan. 30	Conference at Detroit with Mr. Liddle on sewerage and water supply for Sibley Park sub-division	D. W. Bingham.
South Haven	Feb. 19	Typhoid investigation	E. L. Waterman.
Springport	Aug. 14	School house sanitation	F. G. Legg.
Sturgis	Oct. 13	Sewage disposal	F. G. Legg.
Sturgis	Oct. 16	Conference with Board of Public Works	F. G. Legg.
Sturgis	Dec. 1	Inspection of sewage disposal plant	F. G. Legg.
Sturgis	Dec. 26	Inspection of sewage treatment plant	F. G. Legg.
Sturgis	May 21	Water supply and sewage disposal	F. G. Legg.
St. Charles	Nov. 16	Conference with Supt. of Public Works on water supply and sewage disposal	F. G. Legg.
St. Clair	Aug. 24	Purity of bottled water supply	D. W. Bingham.
St. Clair	Feb. 6	Water supply	E. L. Waterman.
St. Clair	Mar. 13	Water supply	E. L. Waterman.
St. Clair	Aug. 2	Sewerage	D. W. Bingham.
St. Johns	Aug. 22	Sewage disposal	E. D. Rich.
St. Joseph	Aug. 8–10	Laboratory instruction	E. L. Waterman.
St. Joseph	Sept. 9	Conference with officials regarding proposed sewers	F. G. Legg.
St. Joseph	Dec. 2	Conference with Civic Improvement Society on Health Survey	J. W. Follin.
St. Joseph	Jan. 31	Sewerage	F. G. Legg.
St. Joseph	May 21,22	Water supply	J. L. Crane.
Torch Lake, (Antrim Co.)	Aug. 9	Resort sanitation	D. W. Bingham.
Traverse City	July 21	Water purification	D. W. Bingham.
Traverse City	Aug. 24,25	Laboratory instruction	J. W. Follin.
Traverse City	Sept. 22	Laboratory instruction	E. L. Waterman.
Traverse City	June 22	Resort sanitation	D. W. Bingham.
Venice on the Lake	Aug. 15	Conference at Detroit with A. Roth on water and sewer systems	D. W. Bingham.
Wahjamega	Aug. 24	Sewage disposal	E. D. Rich.
Wahjamega	Oct. 2	Sewage disposal	D. W. Bingham.
Warren	Sept. 23	Sewerage	D. W. Bingham.
Warren	Oct. 16	Sewage disposal	E. L. Waterman.
Washington Hts.	Nov. 29	Water supply and sewage disposal	F. G. Legg.
Wayne	Apr. 6	Conference, Lansing, on sewerage	E. D. Rich.
Wayne	May 8	Sewerage	F. G. Legg.

TABLE NO. 9.—*Sanitary inspections.—Concluded.*

Location.	Date.	Subject.	Engineer.
Wayland	Aug. 14	Sanitary inspection	J. W. Follin.
Webberville	Apr. 12	Drainage	D. W. Bingham.
Webberville	Apr. 17–29	Sanitary survey	D. W. Bingham.
Wellston	Sept. 20, 21	Typhoid fever investigation	E. L. Waterman.
West Branch	July 24	Conference with Mr. Belknap, Engineer, at Lansing, on sewers	F. G. Legg.
White Cloud	Sept. 6	Testimony before jury on question of Rice Lake drainage	J. W. Follin.
Whitehall	July 17	Nuisance	D. W. Bingham.
White Lake	July 28	Resort sanitation	D. W. Bingham.
Williamston	Feb. 14	Water supply and sewerage	E. D. Rich.
Wyandotte	July 22	Laboratory instruction	J. W. Follin.
Wyandotte	Oct. 18	Water supply and laboratory instruction	E. L. Waterman.
Wyandotte	Nov. 11	Water supply and laboratory instruction	E. L. Waterman.
Wyandotte	Dec. 16	Water supply	E. L. Waterman.
Wyandotte	Jan. 15	Sanitary survey	E. L. Waterman.
Wyandotte	Apr. 20	Water supply	E. L. Waterman.
Yale	Aug. 18	Sewer maps	F. G. Legg.

STATE OF MICHIGAN DEPARTMENT OF HEALTH

CHART SHOWING NUMBER OF INSPECTIONS MADE BY ENGINEERING DIVISION BY MONTHS SINCE THE OFFICE WAS ESTABLISHED

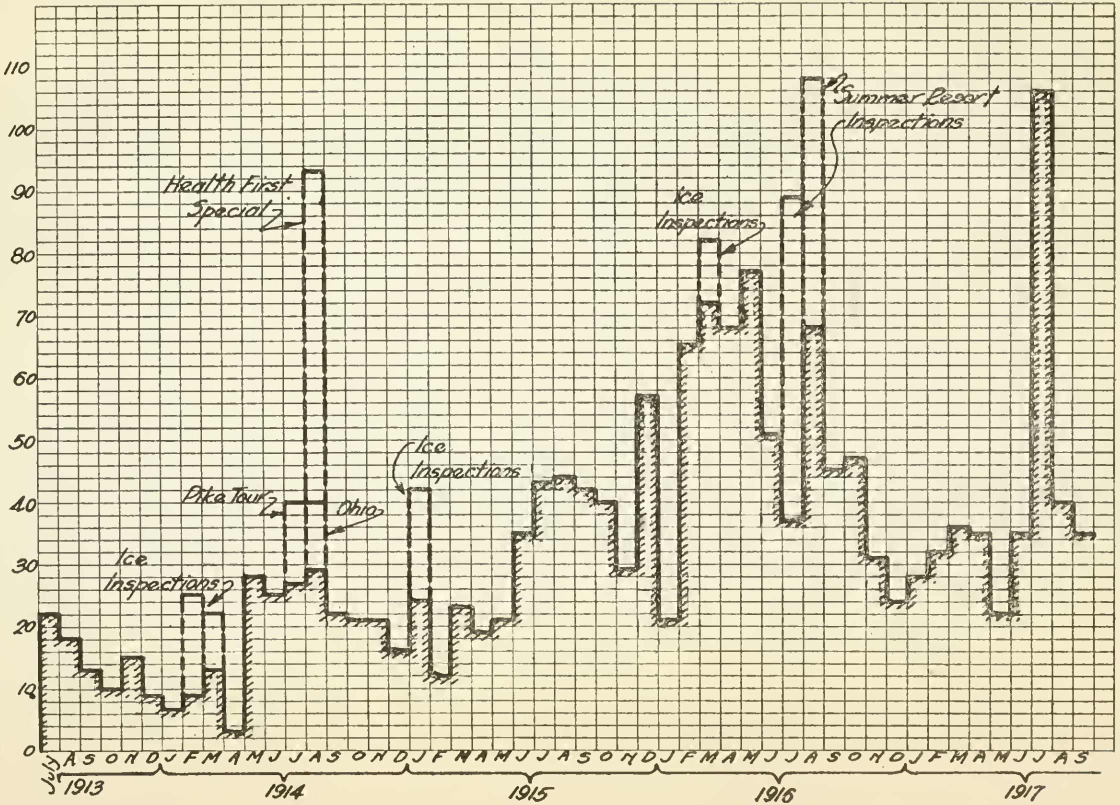


TABLE NO. 10.—*Resort inspection, 1916* (*July and August.*)

Resort.	Location.	Inspector.	Date.
Benona	Claybank Twp	G. W. Hatch	July 18
Bass Lake	(near Ludington)	G. W. Hatch	July 23
Bay Port	Huron County	G. W. Hatch	Aug. 11
Bay View	Emmet County	H. A. Gehring	July 31
Burt Lake	Cheboygan County	H. A. Gehring	Aug. 9
Campbell Park	(near Pentwater)	G. W. Hatch	July 19
Castle Park	Allegan County	Adelbert Barry	July 25
Cavanaugh Lake	Washtenaw County	G. W. Hatch	Aug. 31
Central Park	Ottawa County	Adelbert Barry	July 25
Crystal Lake	Benzie County	H. A. Gehring	July 20
Douglas Village	Allegan County	Adelbert Barry	Aug. 11
East Grand Rapids	Kent County	G. W. Hatch	Aug. 25
Epworth Assembly	(Ludington)	G. W. Hatch	July 19
Fruitport	Ottawa and Muskegon Counties	Adelbert Barry	July 21
Garrison Park	(near Pentwater)	G. W. Hatch	July 19
Grayling	Crawford County	G. W. Hatch	Aug. 14
Glenn Lake	Leelanau County	H. A. Gehring	July 20
Goguac Lake	Calhoun County	G. W. Hatch	Aug. 30
Green Lake	Grand Traverse County	H. A. Gehring	July 22
Green Lake	Barry County	G. W. Hatch	Aug. 7
Gull Lake	Kalamazoo County	G. W. Hatch	Aug. 7
Gunn Lake	Barry County	G. W. Hatch	Aug. 7
Hamlin Lake	(near Ludington)	G. W. Hatch	July 25
Highland Park	Ottawa County	Adelbert Barry	July 18
Indian Lake	Cass County	G. W. Hatch	Aug. 17
Indian River	Cheboygan County	H. A. Gehring	Aug. 9
Interlochen	Cheboygan County	H. A. Gehring	July 22
Jennison Park	Ottawa County	Adelbert Barry	July 25
Lake Shore Resort	Allegan County	Adelbert Barry	Aug. 11
Lakeside Park	Monroe County	H. A. Gehring	Aug. 8
Lakeside Resort	Huron County	H. A. Gehring	Aug. 11
Lakewood Park	Monroe County	G. W. Hatch	Aug. 8
Little Traverse Bay	Emmet County	H. A. Gehring	Aug. 3
Mench Lake	Lake County	G. W. Hatch	July 31
Michillinda	Muskegon County	Adelbert Barry	July 17
Monroe Piers	Monroe	G. W. Hatch	Aug. 8
Mullett Lake	Cheboygan County	H. A. Gehring	Aug. 11
Northpoint Pt	Leelanau County	H. A. Gehring	July 22
Oceana Beach	(near Pentwater)	G. W. Hatch	July 19
Omena Point	Leelanau County	H. A. Gehring	July 22
Paw Paw Lake	Berrien County	G. W. Hatch	Aug. 25
Pine Lake	Charlevoix County	H. A. Gehring	July 21
Portage Lake	Manistee County	G. W. Hatch	Aug. 14
Portage Lake	Crawford County	G. W. Hatch	July 26
Port Austin	Huron County	G. W. Hatch	Aug. 11
Pt. Aux Barques	Huron County	G. W. Hatch	Aug. 1
Reeds Lake Resort	Kent County	G. W. Hatch	Aug. 25
Round Lake	Mason County	G. W. Hatch	July 21
Sebewaing	Huron County	G. W. Hatch	Aug. 11
Shelby	Oceana County	G. W. Hatch	July 18
South Haven (and vicinity)	Van Buren County	G. W. Hatch	Aug. 27
Spring Lake	Ottawa and Muskegon Counties	G. W. Hatch	July 21
St. Joseph City	Berrien County	G. W. Hatch	Aug. 17
St. Joseph Resorts	Berrien County	G. W. Hatch	Aug. 17
Stoney Lake	Oceana County	G. W. Hatch	July 18
Sylvan Beach	Muskegon County	H. A. Gehring	July 18
Thorn Apple Lake	Barry County	G. W. Hatch	Aug. 30
Vandercook Lake	Jackson County	G. W. Hatch	Aug. 31
Virginia Park	Ottawa County	Adelbert Barry	July 25
Walloon Lake	Melrose Twp	H. A. Gehring	Aug. 2
Waukazoo Park	Ottawa County	Adelbert Barry	July 25
White Fish Lake	Montcalm County	G. W. Hatch	Aug. 2
White Lake	Muskegon County	G. W. Hatch	July 19

LABORATORY DIVISION.

15

LANSING LABORATORY REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1916.

To the Secretary of the State Board of Health:

Dear Doctor—I have the honor to herewith submit a report of the work done at the laboratory for the fiscal year ending June 30, 1916:

Chemical and bacteriological examinations for potability:		
Number of uncontaminated samples of water reported safe	574	
Number of contaminated samples of water reported unsafe	349	
Total		923
Blood samples examined for Widal's reaction:		
Positive	100	
Negative	704	
Total		804
Throat swabs examined for diphtheria bacilli:		
Postive	1,177	
Negative	3,496	
Total		4,673

For diagnosis, 3515: 706 positive, 2809 negative.
For release, 1158: 471 positive, 687 negative.

Sputa examined for tubercle bacilli:		
Positive	885	
Negative	3,231	
Total		4,116
Smears examined for gonococci:		
Positive	35	
Negative	82	
Total		117
Blood	16	
Feces	17	
Milk	156	
Urine	122	
Tissues	40	
Toxicological	3	
Beverages	10	
Miscellaneous	115	479
Grand total number of examinations		11,122
Mailing outfits sent out during the year:		
Sputa		3,802
Diphtheria		3,995
Typhoid		1,096

Summary of examinations for the year ending June 30, 1916, compared with summary of examinations for year ending June 30, 1915:

	1916.	1915.
Chemical and bacteriological examinations of water for potability........	933	1,382
Sputa examined for tubercle bacilli....................................	4,116	3,106
Throat swabs examined for diphtheria bacilli.........................	4,673	4,353
Blood samples examined for Widal's reaction..........................	804	770
Chemical and microscopical examinations of urine.....................	122	140
Pathological examinations of feces.....................................	17	14
Pathological examinations of tissues...................................	40	43
Miscellaneous blood examinations......................................	16	14
Chemical and bacteriological examinations of milk.....................	156	587
Examinations for venereal disease......................................	117	159
Toxicological and medico-legal examinations...........................	3	13
Beverages examined..	10	35
Miscellaneous examinations..	115	239
Grand total number of examinations..........................	11,122	10,855

SUMMARY OF EXAMINATIONS ARRANGED BY MONTHS.

Month.	Waters.		Sputa, tuberculosis.		Throat swabs, diphtheria.		Blood, Widal's reaction.		Smears, venereal.		Miscellaneous.	Total.
	Safe.	Unsafe.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.		
July, 1915......	39	41	66	232	49	74	9	51	2	7	90	660
August, 1915....	57	53	98	256	39	64	12	75	5	5	51	715
September, 1915.	43	48	78	225	48	80	5	74	5	8	32	646
October, 1915...	30	42	73	225	278	352	6	94	4	8	39	1,151
November, 1915.	51	38	69	226	355	1,992	6	69	6	4	19	2,835
December, 1915..	50	13	65	259	118	301	9	50	......	1	29	895
January, 1916...	86	26	70	281	46	109	7	38	2	5	49	719
February, 1916..	52	16	65	311	28	73	8	45	3	5	18	624
March, 1916....	37	7	95	336	41	123	9	46	2	7	20	713
April, 1916......	45	15	76	279	44	122	10	46	2	12	59	710
May, 1916......	53	26	74	308	73	134	6	67	3	11	31	786
June, 1916......	40	25	56	293	58	72	13	49	1	9	42	658
Total.......	583	350	885	3,231	1,177	3,496	100	704	35	82	479	11,122

SUMMARY OF WATER EXAMINATIONS FOR THE YEAR ENDING JUNE 30, 1916.

Location.	Safe.	Unsafe.	No. examined.
Ahmeek	0	1	1
Albion	5	0	5
Algonac	0	2	2
Allen	0	2	2
Alma	1	0	1
Alpena	38	7	45
Alpha	1	1	2
Bancroft	1	0	1
Battle Creek	7	0	7
Bay City	10	3	13
Bay Port	0	2	2
Bellaire	1	0	1
Belleville	0	1	1
Bellevue	2	2	4
Benton Harbor	3	3	6
Berlin	0	1	1
Bessemer	7	2	9
Beulah	2	0	2
Big Rapids	4	0	4
Black River	0	1	1
Blissfield	3	4	7
Brant	2	1	3
Breckenridge	0	1	1
Brimley	1	0	1
Bronson	18	2	20
Brooklyn	1	0	1
Bruce Crossing	1	0	1
Brutus	3	0	3
Buckley	1	1	2
Burlington	0	1	1
Burt	1	0	1
Byron Center	1	2	3
Cadillac	25	28	53
Caledonia	1	3	4
Calumet	3	3	6
Camden	2	0	2
Caro	0	1	1
Caseville	0	2	2
Cass City	2	0	2
Cassopolis	9	3	12
Ceresco	1	0	1
Charlotte	3	2	5
Chesaning	1	0	1
Clayton	1	0	1
Climax	0	2	2
Coldwater	3	0	3
Colon	0	1	1
Constantine	3	2	5
Coopersville	0	2	2
Croswell	0	1	1
Crystal	5	4	9
Crystal Falls	0	4	4

Location.	Safe.	Unsafe.	No. examined
Dearborn	0	1	4
Decatur	4	0	1
Deerfield	1	0	1
Detroit	3	5	8
Dundee	1	0	1
Durand	3	1	4
Eagle	0	1	1
East Jordan	1	0	1
East Lansing	1	3	4
Eastmanville	0	4	4
East Tawas	1	0	1
Edmore	1	1	2
Elba	1	0	1
Eloise	0	1	1
Elsie	3	4	7
Escanaba	1	4	5
Estey	0	1	1
Evans	1	0	1
Farmington	1	0	1
Flint	3	0	3
Flushing	1	0	1
Fowler	0	1	1
Fowlerville	1	0	1
Frankfort	12	6	18
Freeland	0	1	1
Fremont	2	5	7
Gaylord	1	0	1
Germfask	2	0	2
Gilford	1	0	1
Gladstone	4	0	4
Gladwin	0	1	1
Grand Haven	1	0	1
Grand Ledge	2	3	5
Grand Rapids	9	2	11
Grandville	1	0	1
Grass Lake	0	1	1
Grayling	0	1	1
Hamilton	2	0	2
Hancock	3	4	7
Harbor Beach	1	1	2
Hartford	1	0	1
Hastings	5	2	7
Henderson	1	0	1
Hillman	1	0	1
Hillsdale	14	6	20
Holland	10	3	13
Homer	0	1	1
Hopkins	1	1	2
Houghton	4	0	4
Howell	1	0	1
Indian River	1	0	1
Ionia	4	4	8
Ironwood	0	2	2
Jackson	1	0	1
Jackson Junction	1	0	1
Jennings	4	0	4

Location.	Safe.	Unsafe.	No. examined.
Kalkaska	3	0	3
Kewadin	1	0	1
Lake Odessa	0	1	1
Lansing	24	10	34
La Salle	1	0	1
Lapeer	2	0	2
Le Roy	2	0	2
Leslie	0	1	1
Ludington	19	2	21
McBain	2	0	2
Macatawa	1	0	1
Mackinac Island	3	1	4
Mackinaw City	2	0	2
Manistee	2	0	2
Manistique	0	2	2
Manton	1	0	1
Maple Rapids	0	1	1
Marcellus	0	1	1
Marion	2	0	2
Marlette	3	0	3
Marshall	2	0	2
Marine City	0	2	2
Mason	1	0	1
Mayville	1	0	1
Mears	1	0	1
Mesick	1	0	1
Michigamme	1	1	2
Middleton	0	1	1
Midland	0	12	12
Millet	0	2	2
Monroe	5	6	11
Morenci	1	0	1
Morgan	0	1	1
Morley	2	0	2
Mt. Clemens	9	3	12
Mt. Pleasant	3	1	4
Muir	1	1	2
Munising	0	2	2
Muskegon	5	2	7
Nashville	1	1	2
Niles	2	0	2
North Branch	1	1	2
Northport	3	1	4
North Star	0	2	2
Nottawa	1	0	1
Novi	1	0	1
Norway	8	0	8
Ocqueoc	1	1	2
Onaway	1	0	1
Onsted	2	2	4
Ontonagon	4	2	6
Orange	0	1	1
Orion	1	0	1
Ortonville	1	0	1
Osseo	0	1	1
Ottawa	1	0	1
Otsego	1	2	3
Owosso	8	1	9

Location.	Safe.	Unsafe.	No. examined.
Palo	1	2	3
Parma	1	1	2
Paw Paw	3	1	4
Pentwater	1	1	2
Perry	3	0	3
Petersburg	0	4	4
Petoskey	5	0	5
Pewamo	1	2	3
Pigeon	1	0	1
Pine Lake	4	1	5
Pinnebog	0	1	1
Plainwell	1	0	1
Pontiac	1	1	2
Port Huron	9	14	23
Puritan	2	0	2
Railroad	19	4	23
Reading	1	0	1
Redbridge	1	1	2
Reese	2	0	2
Remus	1	1	2
Rhodes	0	1	1
Rives Junction	1	0	1
Rochester	2	1	3
Rockford	3	2	5
Rockland	5	0	5
Romulus	1	3	4
Royal Oak	2	0	2
Rudyard	0	1	1
St. Clair	5	8	13
St. Johns	2	0	2
St. Joseph	22	8	30
St. Louis	2	1	3
Saginaw	3	8	11
Salem	0	2	2
Saline	0	1	1
Sand Lake	3	0	3
Sanford	2	2	4
Saranac	1	0	1
Sault Ste. Marie	2	1	3
Sawyer	0	1	1
Schoolcraft	1	0	1
Sharon	0	1	1
Sherwood	0	2	2
South Haven	0	1	1
Sparta	1	2	3
Stanton	0	1	1
Steinhoff	1	0	1
Stevensville	1	0	1
Stockbridge	0	1	1
Traverse City	5	5	10
Trenton	1	3	4
Vandalia	0	2	2
Vermontville	0	1	1
Wakefield	1	2	3
Watervliet	1	0	1
White Cloud	1	1	2
Whittaker	1	0	1
Wilber	1	2	3

Location.	Safe.	Unsafe.	No. examined.
Williamston	2	0	2
Willis	0	1	1
Woodland	4	0	4
Wyandotte	5	9	14
Zeeland	8	0	8
Unclassified samples from rural districts	7	5	12

LANSING LABORATORY REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1917.

To the Secretary of the State Board of Health:

Dear Doctor—I have the honor to herewith submit a report of the work done at the laboratory for the fiscal year year ending June 30, 1917:

Chemical and bacteriological examinations for potability:		
Number of uncontaminated samples of water reported safe	1,047	
Number of contaminated samples of water reported unsafe	743	
Total		1,790
Blood samples examined for Widal's reaction:		
Positive	327	
Negative	577	
Total		904
Blood samples examined for Wassermann's reaction:		
Positive	133	
Negative	225	
Doubtful	8	
Total		366
Throat swabs examined for diphtheria bacilli:		
Positive	1,324	
Negative	3,400	
Total		4,724
For diagnosis 2,964; 619 positive, 2,345 negative.		
For release 1,760; 705 positive, 1,055 negative.		
Sputa examined for tubercle bacilli:		
Positive	716	
Negative	2,852	
Total		3,568
Smears examined for gonococci:		
Positive	68	
Negative	109	
Total		177
Blood	19	
Feces	30	
Milk	71	
Urine	154	
Tissues	36	
Toxicological	3	
Beverages	6	
Miscellaneous	136	
		454
Grand total number of examinations		11,983

Mailing outfits sent out during the year:

Sputa	3,523
Diphtheria	4,715
Typhoid	1,243
Syphilis	194

Summary of examinations for year ending June 30, 1917, compared with summary of examinations for year ending June 30, 1916:

	1917.	1916.
Chemical and bacteriological examinations of water for potability	1,790	933
Sputa examined for tubercle bacilli	3,568	4,116
Throat swabs examined for diphtheria bacilli	4,724	4,673
Blood samples examined for Widal's reaction	904	804
Blood samples examined for Wassermann's reaction	366	.....
Chemical and microscopical examinations of urine	154	122
Pathological examinations of feces	30	17
Pathological examinations of tissues	35	40
Miscellaneous blood examinations	19	16
Chemical and bacteriological examinations of milk	71	156
Examinations for venereal disease	177	117
Toxicological and medico-legal examinations	3	3
Beverages examined	6	10
Miscellaneous examinations	136	115
Grand total number of examinations	11,983	11,122

SUMMARY OF EXAMINATIONS ARRANGED BY MONTHS.

Months.	Waters.		Sputa, tuberculosis.		Throat swabs, diphtheria.		Blood, Widal's reaction.		Blood, Wassermann's reaction.			Smears, venereal.		Miscellaneous.	Total.
	Safe.	Unsafe.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Doubtful.	Pos.	Neg.		
July, 1916	87	68	56	184	35	43	111	48	0	4	0	1	8	33	578
August, 1916	111	121	72	210	37	74	66	98	2	7	0	1	2	39	840
September, 1916	102	92	65	167	75	77	51	96	6	10	0	5	6	36	788
October, 1916	79	70	64	209	161	446	53	55	4	10	0	4	11	22	1,188
November, 1916	52	42	57	246	190	493	28	34	8	7	0	9	12	26	1,204
December, 1916	58	41	51	221	262	601	21	35	2	7	0	5	4	32	1,340
January, 1917	86	13	58	245	103	647	6	23	5	7	1	9	9	66	1,278
February, 1917	51	13	61	274	75	116	11	28	12	20	2	3	5	29	700
March, 1917	76	49	58	332	90	279	12	37	19	37	0	4	7	39	1,039
April, 1917	117	65	56	261	143	262	10	34	35	35	3	9	8	37	1,073
May, 1917	120	78	50	298	78	246	13	41	21	41	2	7	15	44	1,054
June, 1917	108	93	68	205	75	116	45	48	19	40	0	11	22	51	901
Total	1,047	743	716	2,852	1,324	3,400	327	577	133	325	8	68	109	454	11,983

SUMMARY OF WATER EXAMINATIONS FOR THE YEAR ENDING JUNE 30, 1917.

Location.	Safe.	Unsafe.	No. examined.
Adrian	2	1	3
Algonac	2	1	3
Allegan	1	0	1
Allen	3	1	4
Alma	3	5	8
Almont	0	1	1
Alpena	0	1	1
Alpha	1	0	1
Alto	0	1	1
Ann Arbor	1	1	2
Atlanta	4	1	5
Augusta	2	0	2
Baldwin	0	1	1
Batavia	0	1	1
Bath	13	8	21
Battle Creek	18	2	20
Bay City	1	5	6
Bay Port	2	2	4
Beaverton	1	0	1
Belding	0	1	1
Benton Harbor	7	2	9
Berrien Center	1	0	1
Bessemer	0	1	1
Beulah	1	1	2
Big Rapids	3	1	4
Birch Run	0	1	1
Birmingham	1	0	1
Blissfield	1	1	2
Boyne Falls	1	0	1
Breckenridge	7	1	8
Bronson	2	1	3
Brutus	2	0	2
Buchanan	1	5	6
Buckley	1	0	1
Burr Oak	1	0	1
Byron Center	4	1	5
Cadillac	18	30	48
Caledonia	1	1	2
Camden	1	0	1
Capac	2	1	3
Caseville	0	3	3
Cass City	1	0	1
Cassopolis	6	10	16
Castle Park	1	0	1
Centerville	0	1	1
Charlotte	1	2	3
Cheboygan	2	0	2
Clam Lake	0	1	1
Clarksville	0	2	2
Clio	1	0	1
Coldwater	6	1	7
Coloma	3	2	5
Colon	2	0	2
Conklin	1	1	2

Location.	Safe.	Unsafe.	No. examined.
Coopersville	1	2	3
Croswell	1	3	4
Crystal	1	2	3
Decatur	4	1	5
Detroit	5	0	5
Dewitt	1	0	1
Dexter	1	1	2
Dundee	0	3	3
Durand	2	1	3
East Tawas	1	5	6
Eaton Rapids	0	1	1
Eau Claire	2	3	5
Edmore	2	0	2
Elk Rapids	0	2	2
Ellsworth	0	1	1
Elsie	0	1	1
Essexville	4	0	4
Ewen	0	1	1
Fenton	0	2	2
Fife Lake	1	0	1
Flint	1	0	1
Flushing	1	3	4
Fountain	1	0	1
Fowlerville	0	1	1
Frankfort	10	6	16
Fremont	4	0	4
Gagetown	1	0	1
Gaines	1	0	1
Ganges	0	1	1
Gladstone	2	0	2
Gobleville	3	0	3
Grand Haven	0	1	1
Grand Ledge	2	1	3
Grand Rapids	3	2	5
Grayling	1	3	4
Grosse Isle	0	2	2
Hamilton	0	1	1
Harbor Beach	39	17	56
Hastings	1	0	1
Hemlock	1	0	1
Hesperia	0	1	1
Hickory Corners	2	1	3
Hillsdale	28	17	45
Holland	41	7	48
Holt	2	0	2
Howard City	5	0	5
Howell	3	2	5
Hudson	1	1	2
Ionia	17	5	22
Iron Mountain	4	1	5
Iron River	2	0	2
Ithaca	2	2	4
Jackson	15	8	23
Jennings	4	1	5
Jennison	1	0	1

Location.	Safe.	Unsafe.	No. examined.
Kalamazoo	10	4	14
Kalkaska	1	0	1
Kendall	2	0	2
Lake City	1	1	2
Lake Harbor	0	1	1
Lake Orion	10	7	17
Lake Odessa	1	1	2
Lakeview	1	1	2
Lansing	77	32	109
Lapeer	2	1	3
Lawrence	2	0	2
Leslie	1	0	1
Linden	1	1	2
Lowell	15	6	21
Ludington	14	1	15
McCarron	2	0	2
Macatawa	1	0	1
Mackinaw City	1	0	1
Manchester	0	1	1
Manistee	1	0	1
Manistique	0	1	1
Manton	2	0	2
Maple Rapids	0	1	1
Marcellus	1	0	1
Marine City	45	89	134
Marshall	1	0	1
Martin	1	0	1
Mason	0	3	3
Memphis	0	1	1
Mendon	6	1	7
Metamora	0	2	2
Midland	3	6	9
Milford	0	2	2
Monroe	17	17	34
Morenci	0	1	1
Morrice	0	1	1
Mt. Clemens	21	16	37
Mt. Pleasant	1	3	4
Muir	7	8	15
Mulliken	1	0	1
Munising	3	7	10
Muskegon	0	4	4
Nashville	2	2	4
New Buffalo	1	0	1
Niles	7	1	8
North Branch	1	1	2
Northport	5	0	5
North Star	1	0	1
Northville	2	1	3
Norway	8	2	10
Oak Grove	1	1	2
Old Mission	1	0	1
Omer	0	1	1
Onaway	0	2	2
Onsted	1	0	1
Ontonagon	3	1	4
Orchard Lake	2	0	2
Orion	1	1	2
Oscoda	1	0	1

Location.	Safe.	Unsafe.	No. examined.
Owosso	5	0	5
Palmyra	1	0	1
Parklake	0	1	1
Paw Paw	8	3	11
Pentwater	3	0	3
Perry	0	2	2
Petersburg	0	3	3
Petoskey	5	0	5
Pierpont	1	0	1
Pine Lake	0	1	1
Plainwell	1	0	1
Pontiac	2	1	3
Port Austin	1	0	1
Port Huron	18	6	24
Potterville	2	0	2
Quincy	1	2	3
Railroad	107	44	151
Rapid River	1	0	1
Redford	5	6	11
Reed City	1	0	1
Remus	1	0	1
Republic	1	0	1
Riga	1	0	1
Ross	0	1	1
Royal Oak	4	7	11
Saginaw	29	28	57
St. Clair	75	79	154
St. Ignace	1	0	1
St. Joseph	2	1	3
Saline	0	1	1
Sandusky	1	1	2
Saranac	0	1	1
Sault Ste. Marie	2	4	6
South Haven	1	0	1
Sparta	2	6	8
Spring Arbor	1	0	1
Springport	1	0	1
Stambaugh	1	0	1
Standish	1	0	1
Stanwood	1	0	1
Stockbridge	1	0	1
Sturgis	2	0	2
Three Oaks	1	0	1
Three Rivers	28	14	42
Thompsonville	1	0	1
Traverse City	5	2	7
Turner	1	1	2
Union City	1	0	1
Vandalia	2	3	5
Vermontville	0	1	1
Vulcan	1	0	1
Wahjamega	6	1	7
Wakefield	0	1	1
Waldron	1	0	1
Watervliet	2	0	2
Wayland	1	2	3

Location.	Safe.	Unsafe.	No. examined.
Wayne	0	2	2
Webberville	2	0	2
Wellston	4	9	13
White Cloud	1	0	1
Williamsburg	0	1	1
Williamston	0	1	1
Wyandotte	6	3	9
Yale	0	1	1
Ypsilanti	1	0	1
Zeeland	3	2	5
Unclassified samples from rural districts	44	52	96

The annual reports for the years ending June, 1916, and June, 1917, not only show a steady increase in the number of examinations, but the methods of examination of many of these specimens have been changed so that it requires more help and more time in performing them. The method of running water examinations has been necessarily changed on account of the U. S. Public Health Service requirements. This alone requires about six times as much work to do one specimen as it did formerly to do six. Other methods have also been changed in order to increase the efficiency of the work.

Very truly yours,
A. A. SPOOR,
Bacteriologist.

DIVISION OF COMMUNICABLE DISEASES

FOR YEAR ENDING DECEMBER 31, 1915.

TUBERCULOSIS IN MICHIGAN, IN 1915 AND PRECEDING YEARS.

At the close of the year 1915, there were on record in the office of the State Board of Health the names and other data of 6,391 persons, residents of Michigan, who were reported as being sick with some form of tuberculosis. This number of living cases represents the largest number ever on record in this office at any one time.

As the tuberculosis survey, authorized by an act of the legislature in 1915, did not begin until October 1 of that year, in fact, only the counties of Wexford, Barry, Ottawa, Grand Traverse, Leelanau and St. Clair having been surveyed before the close of that year, only a small percentage of the above mentioned number of cases can be said to have been reported through that medium, but were reported by the physicians who attended the cases, as required by law. In Table 1 is shown the distribution of these 6,391 living cases by counties, also showing the case rates per 100,000 population in each of the counties.

It will be noticed that for the State as a whole the case rate was 210 persons sick with tuberculosis per each 100,000 population, and that, in the various sections of the State, the rate deviated considerably from this average, the rate for each of the sections of the State being as follows: Upper Peninsula Section, 133.9; Northern Section, 103.5; Central Section, 88.7, and Southern Section, 273.5 cases per 100,000 population. The error in the case rate of the various sections of the State lies in the failure of physicians to report recognized cases of tuberculosis, and the total case rate for each section is, therefore, undoubtedly, too low. There is no reason, however, to believe that the failure to report recognized cases affects one section of the state more than another, and while the ratio of cases to the population may be too low in general, still, the relation of the case rates as between the various sections is in all probability approximately correct. That this belief is true is corroborated, to an extent, by comparing the case rates of the various sections of the State, as shown in Table 1, with the death rates from this disease with the same sections as shown in Table 1, even though the death rates of the sections in the latter named Table pertain to the rural districts only, while the case rates shown in the former Table pertain to the urban and rural districts combined. It will be seen by this comparison, that the sections of the State showing the highest case rates also show the highest death rates.

TABLE NO. 1.—*Showing the number of living cases of tuberculosis (all forms) by sex, reported to and on record in the office of this department, in each of the counties of Michigan at the close of the year 1915, together with the case rates per 100,000 population by counties.*

State and counties by geographical sections.	Living cases of tuberculosis.			Total cases per 100,000 of total population.
	Total.	Males.	Females.	
STATE OF MICHIGAN	**6,391**	**3,541**	**2,850**	**210.0**
I.—Upper Peninsula Counties	**492**	**296**	**196**	**133.9**
Alger	7	3	4	81.2
Baraga	3	3	0	43.0
Chippewa	41	24	17	155.1
Delta	11	5	6	33.7
Dickinson	25	14	11	114.4
Gogebic	30	23	7	105.8
Houghton	203	114	89	197.7
Iron	13	9	4	63.8
Keweenaw	9	6	3	96.5
Luce	*2	1	1	48.7
Mackinac	4	3	1	39.7
Marquette	93	62	31	177.7
Menominee	37	20	17	148.2
Ontonagon	2	1	1	20.2
Schoolcraft	12	8	4	137.5
II.—Northern Counties	**346**	**169**	**177**	**103.5**
Alcona	2	1	1	35.0
Alpena	15	9	6	74.5
Antrim	12	6	6	76.3
Arenac	4	2	2	43.5
Benzie	11	8	3	104.6
Charlevoix	23	13	10	106.7
Cheboygan	19	8	11	103.3
Clare	1	0	1	10.8
Crawford	4	4	0	100.0
Emmet	30	15	15	156.9
Gladwin	5	3	2	60.6
Grand Traverse	78	28	50	321.4
Iosco	4	3	1	44.0
Kalkaska	5	2	3	58.8
Lake	3	0	3	61.4
Leelanau	18	11	7	172.6
Manistee	24	12	12	91.3
Mason	14	5	9	59.1
Missaukee	8	3	5	73.5
Montmorency	4	4	0	101.1
Ogemaw	4	1	3	45.8
Osceola	9	5	4	52.1
Oscoda	1	0	1	46.7
Otsego	7	5	2	117.1
Presque Isle	6	5	1	51.9
Roscommon	4	3	1	146.7
Wexford	31	13	18	140.5
III.—Central Counties	**409**	**215**	**194**	**88.7**
Bay	77	40	37	106.6
Gratiot	22	9	13	80.3
Huron	37	15	22	106.9
Isabella	10	4	6	45.2
Mecosta	17	10	7	90.2
Midland	9	7	2	66.8
Montcalm	21	12	9	67.6
Muskegon	27	17	10	62.4
Newaygo	4	1	3	20.1
Oceana	10	5	5	52.8
Saginaw	132	71	61	143.0
Sanilac	22	11	11	66.4
Tuscola	21	13	8	61.7

TABLE NO. 1.—*Concluded.*

State and counties by geographical sections.	Living cases of tuberculosis.			Total cases per 100,000 of total population.
	Total.	Males.	Females.	
IV.—Southern Counties	5,144	2,861	2,283	273.5
Allegan	25	9	16	61.7
Barry	91	23	68	393.3
Berrien	67	28	39	117.2
Branch	24	13	11	96.2
Calhoun	75	32	43	125.6
Cass	15	8	7	71.0
Clinton	14	7	7	65.4
Eaton	19	10	9	62.7
Genesee	203	71	132	245.4
Hillsdale	19	10	9	64.3
Ingham	111	49	62	180.8
Ionia	48	29	19	147.0
Jackson	108	57	51	184.0
Kalamazoo	230	127	103	331.8
Kent	517	265	252	293.2
Lapeer	†32	18	14	127.1
Lenawee	24	9	15	51.2
Livingston	‡55	27	28	324.0
Macomb	26	14	12	80.6
Monroe	17	7	10	51.6
Oakland	77	34	43	145.9
Ottawa	96	36	60	200.5
St. Clair	112	49	63	225.8
St. Joseph	15	10	5	54.8
Shiawassee	25	14	11	76.1
Van Buren	35	16	19	110.4
Washtenaw	96	55	41	223.3
Wayne	2,968	1,834	1,134	455.1

*These cases were reported from the Hospital for the Insane, and are equivalent to 203.5 cases per 100,000 inmates.

†Fifteen of these cases were reported from the Michigan Home and Training School, and are equivalent to 1,250.0 cases per 100,000 inmates.

‡Twenty of these cases were reported from the State Tuberculosis Sanatorium in Marion township.

DISTRIBUTION OF LIVING CASES OF TUBERCULOSIS (ALL FORMS) IN CITIES OF MICHIGAN OF 10,000 INHABITANTS AND OVER, AS APPEARED BY THE RECORDS OF 1915.

In Table 1a is shown the living cases of tuberculosis (all forms) in cities of Michigan having 10,000 or more inhabitants and their case rates per 100,000 population. These localities constitute what is termed throughout this report as "Urban districts."

What has been said regarding the case rates generally and the relation of case rates as between the different sections of the State, will apply with equal force to the localities shown in this table.

The case rate of all cities having 10,000 or more inhabitants was 381.4 per 100,000 estimated population in 1915. The group of cities having the greatest number of inhabitants experienced the highest case rate, and the same diminished for each group of cities as the size of the cities constituting the same grew smaller. The group of cities having 100,000 or more population registered a case rate of 495.5 per 100,000 inhabitants; cities from 50,000 to 100,000 population, 284.2; cities from 25,000 to 50,000, 236.6; and cities from 10,000 to 25,000 population, 219.0.

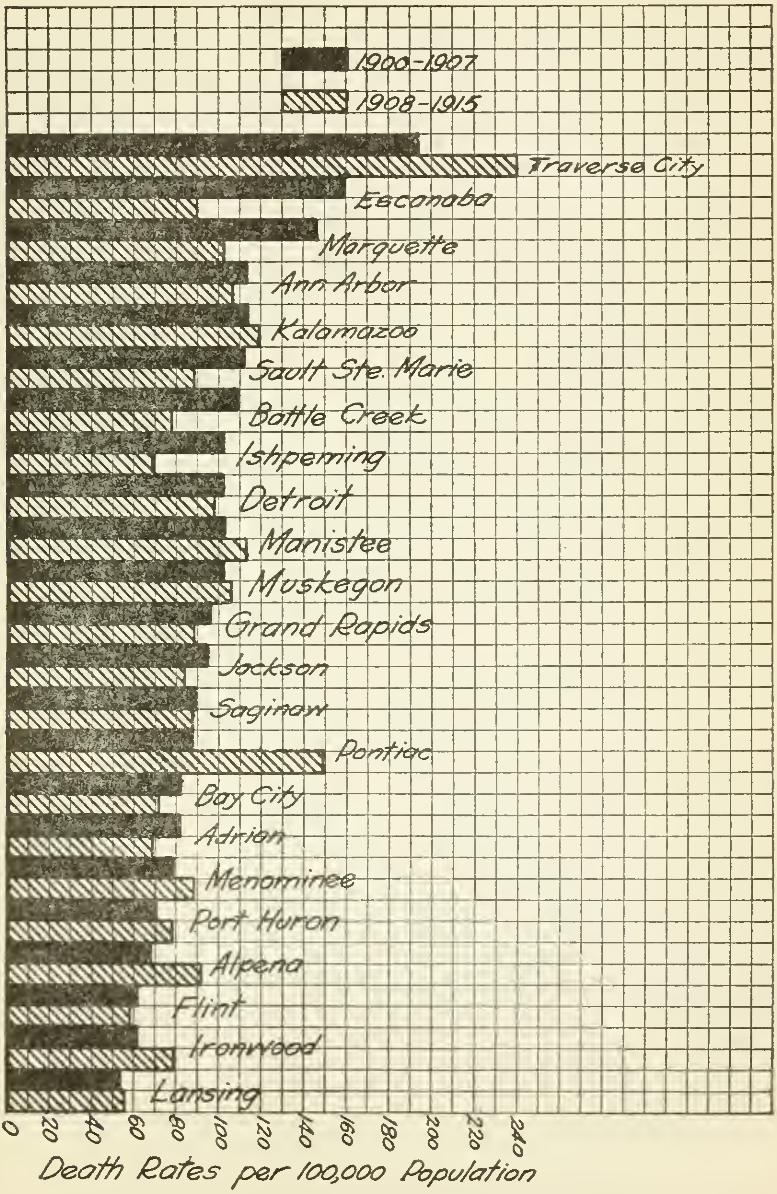
TABLE NO. 1A.—*Showing the number of cases of tuberculosis (all forms) reported to the State Board of Health, and which were still living at the close of the year 1915 in cities of Michigan of 10,000 inhabitants and over; also showing the case rate per 100,000 population of these cities in 1915.*

Cities.	Total.	Males.	Females.	Total cases per 100,000 total population.
TOTAL FOR CITIES OF 10,000 POPULATION AND OVER	4,624	2,657	1,967	381.4
Cities over 100,000 population	3,372	2,036	1,336	495.5
Detroit	2,897	1,789	1,108	522.2
Grand Rapids	475	247	228	377.7
Cities from 50,000 to 100,000 population	304	128	176	284.2
Flint	185	65	120	354.7
Saginaw	119	63	56	217.1
Cities from 25,000 to 50,000 population	528	282	246	236.6
Battle Creek	36	20	16	125.0
Bay City	72	39	33	151.6
Jackson	89	48	41	256.3
Kalamazoo	*221	122	99	466.6
Lansing	89	38	51	228.2
Muskegon	21	15	6	81.5
Cities from 10,000 to 25,000 population	420	211	209	219.0
Adrian	3	2	1	26.4
Alpena	15	9	6	113.8
Ann Arbor	76	45	31	507.4
Escanaba	9	4	5	59.5
Holland	12	3	9	100.7
Ironwood	12	8	4	83.0
Ishpeming	23	13	10	184.8
Manistee	12	7	5	96.9
Marquette	28	16	12	228.3
Menominee	20	13	7	190.3
Pontiac	†56	24	32	328.6
Port Huron	64	30	34	339.3
Sault Ste. Marie	26	15	11	189.7
Traverse City	64	22	42	472.6

*This number includes 31 cases in the Hospital for the Insane, and which is equivalent to 1,398.3 cases per 100,000 inmates.

†This number includes 13 cases in the Hospital for the Insane, and which is equivalent to 879.0 cases per 100,000 inmates.

PULMONARY TUBERCULOSIS IN CITIES OF 10,000 POPULATION AND OVER. ANNUAL AVERAGE RATE 1900-1907 AND 1908-1915. ARRANGED ACCORDING TO HIGHEST RATE FOR FIRST PERIOD



GENERAL PREVALENCE OF PULMONARY TUBERCULOSIS, IN MICHIGAN, PREVALENCE BASED ON DEATH RATES.

Notwithstanding the fact that the number of living cases of tuberculosis on record in this office at the close of the year 1915 represents the largest number of existing cases on record in any one year, the data cannot be employed in determining the comparative prevalence of the disease from year to year or as between localities, therefore, these conclusions must be based on the deaths from this disease, as the number recorded are supposed to represent 100 per cent of the number that actually occurred. The data pertaining to living cases of tuberculosis will undoubtedly be more complete for the year 1916, owing to the greater number of cases having been reported through the medium of the tuberculosis survey, began October 1, 1915, and from which much interesting and new information will be gained, and which will be of great value in combating this disease.

As a standard by which to measure the comparative prevalence of tuberculosis (prevalence based on death rates), in Michigan, the data shown in Table 2 have been divided into two periods of eight years each, 1900-1907 and 1908-1915, for comparison, as by this method any abnormal condition existing in any one year, tending to lower or raise the death rate, is equalized by the more normal conditions existing in other years.

In Michigan, during the years 1900 to 1907, inclusive, there occurred 17,782 deaths from pulmonary tuberculosis, or 2,223 deaths on the average annually, which numbers correspond to an annual death rate of 86.8 per each 100,000 population. During the following eight years, 1908-1915, 18,653 died from this form of the disease, which number corresponds to 2,332 deaths annually or 81.0 deaths per each 100,000 population. Thus it will be seen that while the actual number of deaths, during the eight years, 1908-1915, increased 4.9 per cent over the period 1900-1907, the death rate (which takes into consideration the increase or decrease of the population) declined 6.7 per cent during the latter period. Expressed otherwise, this decline of 6.7 per cent in the death rate means that there were 1,328 fewer deaths during the years 1908 to 1915 than occurred durin the eight years, 1900 to 1907.

Other forms of tuberculosis caused on the average 396 deaths annually during the years 1900-1907 or which is equivalent to 15.5 deaths per each 100,000 population, while during the period 1908-1915 this average loss of life amounted to 421, or 14.6 deaths per 100,000 population, the reduction in the death rate amounting to 5.8 per cent in the latter period over the former.

TABLE NO. 2.—*Showing the deaths from pulmonary tuberculosis and from other forms of tuberculosis; also the death rates per 100,000 population in Michigan, during the years 1900–1915.*

Years.	Pulmonary tuberculosis.		Other forms of tuberculosis.	
	Deaths.	Deaths per 100,000 population.	Deaths.	Deaths per 100,000 population.
1900	2,183	90.0	402	16.6
1901	2,165	87.9	369	15.0
1902	2,083	83.2	346	13.8
1903	2,136	84.0	403	15.9
1904	2,309	89.4	419	16.2
1905	2,261	86.3	421	16.1
1906	2,239	87.9	421	15.8
1907	2,316	85.8	386	14.3
Annual average, 1900–1907	2,223	86.8	396	15.5
1908	2,243	81.9	463	16.9
1909	2,238	80.5	402	14.5
1910	2,325	82.5	427	15.2
1911	2,330	81.5	427	14.9
1912	2,324	80.2	407	14.0
1913	2,273	77.4	420	14.3
1914	2,364	79.7	416	14.0
1915	2,556	84.8	406	13.5
Annual average, 1908–1915	2,332	81.0	421	14.6

PULMONARY TUBERCULOSIS IN MICHIGAN AS COMPARED WITH OTHER STATES.

In order to determine whether this State is experiencing a mortality from pulmonary tuberculosis that is less or in excess of that of other states, in proportion to population; and to learn the extent of this increase or decrease in mortality as between the states, annual average death rates, covering two eight year periods, 1900 to 1907 and 1908 to 1915, have been computed for each of the states of the Registration Area of the United States as it was constituted in the year 1900, with this end in view. As a standard by which to measure the comparative prevalence of tuberculosis, as between the above mentioned states and as between periods of time for the same states, the comparison of the annual average death rates, for the two periods named, is probably the most accurate measurement that could be employed. By this method any abnormal condition that might have existed in any one year, or in any state, tending to lower or raise the death rate, would be equalized by the more normal conditions existing in other years.

In the following table are shown the deaths and annual average death rates per 100,000 population from pulmonary tuberculosis in each of the states of the Registration Area as it was constituted in 1900, for two eight year periods, 1900 to 1907 and 1908 to 1915, together with the per cent of reductions as between the death rates for the two periods under comparison:

State.	1900–1907		1908–1915		Decrease, per cent, between 1900–1907 and 1908–1915.
	Deaths.	Rate.	Deaths.	Rate.	
Rhode Island	6,639	176.8	6,457	143.5	18.8
New York	110,682	174.5	114,739	152.0	12.9
New Jersey	28,417	167.8	30,554	144.1	14.1
Massachusetts	39,434	164.0	35,376	127.6	22.2
Indiana	32,525	157.4	28,790	131.7	16.3
Connecticut	11,627	148.0	11,611	126.1	14.8
Maine	7,902	138.8	6,513	108.4	21.9
New Hampshire	4,553	136.0	3,637	104.8	22.9
Vermont	3,350	120.3	2,585	90.2	25.0
Michigan	17,782	86.8	18,653	81.0	6.7
Total	262,911	155.6	258,915	132.5	14.8

It will be noted, by the above table, that Michigan's death rates for the two periods of years was considerably lower than the rates for the other states. Expressed in per cents, the death rate for this state for the first period of years was more than 50 per cent less than the rate for Rhode Island, the state having the highest rate for that period; 27.5 per cent lower than the rate for Vermont, which state experienced the next lowest rate to that of Michigan, and 44.2 per cent less than the average rate for all the states combined. In the second period of years, Michigan's death rate was 47 per cent lower than the rate for New York, the state having the highest rate for this period; 10 per cent lower than Vermont's rate and 38.9 per cent lower than the average rate for all these states.

Notwithstanding the fact that Michigan enjoys a low death rate from pulmonary tuberculosis, compared with other states, this state is accomplishing less in her fight on this disease than is either of the other states under comparison. This fact is shown in the above table in the column captioned "Decrease, per cent, between 1900-1907 and 1908-1915."

In the state of Vermont, where the death rate was next lowest to that of Michigan, the death rate for the eight year period ending with 1915, was reduced 25.0 per cent over the rate for the former eight year period, and by the same comparison the death rate was reduced 22.9 per cent in New Hampshire; 22.2 in Massachusetts, 21.9 in Maine; 18.8 in Rhode Island; 14.8 in Connecticut; 14.1 in New Jersey; 12.9 in New York and only 6.7 per cent in Michigan.

Thus, it will be noted, that Michigan drops from the most enviable position, with respect to the comparative prevalence of this disease, to the most unenviable one, from the standpoint of comparative reduction of its prevalence.

DISTRIBUTION OF PULMONARY TUBERCULOSIS BY GEOGRAPHICAL SECTIONS AND IN URBAN AND RURAL DISTRICTS OF MICHIGAN.

In Tables 3 and 3A are shown the deaths from pulmonary tuberculosis and the death rates per 100,000 population for the years 1900 to 1915 in the rural districts of each of the sections of the State and in each of the counties constituting these sections. In the Tables 4 and 4A are shown the deaths from pulmonary tuberculosis and the death rates per 100,000 population in each of the cities of Michigan having 10,000 or more inhabitants, and which localities are termed in this report "Urban districts," while the rural districts are made up of cities and villages of less than 10,000 inhabitants and the townships.

While the death rate from pulmonary tuberculosis was unusually high in Michigan in 1915, still, as may be seen by reference to Table 3A, this increased prevalence did not take place in the rural districts of the state. The death rate in 1915 for the state as a whole (urban and rural districts combined) was 84.8 and for 1914 79.7 deaths per 100,000 population, while the annual average rate for the years 1908 to 1915 was 81.0. Thus it will be seen that the death rate for the State was 6.4 per cent higher than the rate for 1914 and 4.7 per cent higher than the average rate. In the rural districts of the state the death rate from this disease in 1915 was 73.8 and 73.2 in 1914, while the average rate for the eight years ending with 1915 was 73.7. The difference between the rates of the rural districts as between 1915 and 1914 amounted to an increase of only 0.8 of one per cent, while the difference between the rate for 1915 and the average rate was only 0.1 per cent higher in 1915. In the urban districts of Michigan the death rate was 101.6 in 1915 and 89.1 in 1914 and the annual average rate was 93.1. The difference between the rates of 1915 and 1914 shows an increase of 14 per cent in the 1915 rate and an increase of 9.1 per cent compared with the average rate.

It will also be seen by Table 3A that the death rates for the rural districts of the different sections of the State varied considerably in 1915. For instance, for every 100 deaths that occurred from pulmonary tuberculosis in the rural districts of the State in 1915, there occurred 107 in the Upper Peninsula; 69 in the Northern Section; 69 in the Central Section, and 120 in the Southern Section of counties. Exclusive of the rural districts of Wayne County, the ratio of deaths to every 100 for the rural districts would be 85 for the balance of the counties of the Southern Section.

The cities, shown in Table 4A, that experienced unusually high rates in 1915 compared with 1914, named in the order of the highest per cent of increase in the rates, are: Pontiac, 66.6; Ann Arbor, 43.4; Traverse City, 35.1; Muskegon, 31.7; Manistee, 30.7; Kalamazoo, 28.4; Grand Rapids, 24.8, and Marquette, 23.5.

TABLE NO. 3.—*Showing the total deaths from pulmonary tuberculosis in the State of Michigan, in the urban districts (cities of 10,000 inhabitants and over), and in the rural districts of Michigan (cities of less than 10,000 inhabitants and all villages and townships); also the deaths from pulmonary tuberculosis in the rural districts in each county during each of the years 1900–1915.*

State and counties by geographical sections.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	Total deaths, 1900–1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	Total deaths, 1908–1915.
STATE (Urban and rural districts)	2,183	2,165	2,083	2,136	2,309	2,261	2,329	2,316	17,782	2,243	2,238	2,325	2,330	2,324	2,273	2,364	2,556	18,653
URBAN DISTRICTS (Cities of 10,000 inhabitants and over)	754	767	774	795	857	839	881	908	6,575	908	875	999	1,008	1,030	1,021	1,036	1,212	8,089
RURAL DISTRICTS	1,429	1,398	1,309	1,341	1,452	1,422	1,448	1,408	11,207	1,335	1,363	1,326	1,322	1,294	1,252	1,328	1,344	10,564
I.—Upper Peninsula Counties	161	169	156	191	182	210	258	179	1,506	208	237	190	199	227	219	259	224	1,763
Alger	4	5	3	8	5	4	3	3	35	3	3	3	4	6	4	6	5	34
Baraga	2	7	4	5	7	9	14	2	50	8	6	1	6	4	7	5	4	41
Chippewa	6	8	7	9	8	11	13	5	67	10	10	7	3	10	7	7	6	60
Delta	10	10	11	12	8	7	15	13	86	11	19	11	19	4	11	13	10	98
Dickinson	13	18	17	11	14	20	23	12	128	13	23	12	15	18	18	20	16	135
Gogebic	3	8	3	12	5	3	5	9	48	9	10	11	12	10	12	11	21	96
Houghton	60	62	63	71	77	81	107	68	589	76	91	78	70	79	73	101	73	641
Iron	2	6	7	1	5	7	11	5	44	15	6	5	8	6	8	16	10	74
Keweenaw	4	1	2	2	7	7	5	3	31	6	4	9	7	5	7	2	6	46
Luce	3	2	5	6	3	4	8	7	38	6	7	11	4	10	11	14	7	70
Mackinac	11	11	10	10	10	15	9	12	88	10	14	7	9	12	9	8	7	76
Marquette	19	12	12	16	10	18	19	20	126	15	21	12	23	38	32	30	37	208
Menominee	10	4	8	16	9	12	8	6	73	8	10	12	8	17	10	17	5	87
Ontonagon	2	9	2	7	9	8	9	6	52	12	8	6	3	4	1	0	8	42
Schoolcraft	12	6	2	5	5	4	9	8	51	6	5	5	8	4	9	9	9	55
II.—Northern Counties	204	202	192	229	236	202	224	180	1,669	215	230	224	200	186	167	178	157	1,557
Alcona	4	5	3	6	5	5	4	3	35	2	7	6	1	2	4	3	2	27
Alpena	6	6	5	4	9	2	4	3	39	6	5	6	5	5	4	2	5	38
Antrim	14	10	8	10	9	13	14	13	91	7	11	6	12	6	5	11	9	67
Arenac	5	2	6	5	9	3	7	3	40	5	8	10	8	1	7	5	6	50
Benzie	6	15	10	15	9	11	14	13	93	7	13	6	10	4	6	10	5	61
Charlevoix	11	12	16	18	19	11	16	12	115	15	17	19	15	10	16	15	12	119
Cheboygan	7	13	7	13	11	17	18	14	100	10	13	13	12	11	14	16	14	103
Clare	7	5	5	9	7	2	5	7	47	5	7	4	3	7	3	3	5	37

Crawford	1	1	2	1	3	1	1	3	13	1	0	6	4	3	3	1	3	21
Emmet	12	17	18	16	18	18	13	10	122	21	18	15	19	21	18	13	7	132
Gladwin	5	2	3	3	1	5	10	6	35	5	2	2	5	7	3	4	4	32
Grand Traverse	13	8	9	9	12	6	8	9	74	10	9	11	10	6	6	5	3	60
Iosco	8	6	9	12	11	6	4	7	63	7	15	5	4	7	4	7	8	57
Kalkaska	3	8	2	6	4	10	10	3	46	6	11	8	4	5	2	4	6	46
Lake	4	4	4	3	5	1	5	5	31	6	5	5	2	5	3	3	3	32
Leelanau	9	6	10	11	15	8	11	11	81	17	13	16	9	5	8	10	6	84
Manistee	16	5	11	8	11	16	9	11	87	4	11	20	14	15	9	12	9	94
Mason	21	23	14	14	20	17	17	14	140	18	13	20	19	22	14	16	18	140
Missaukee	2	1	6	7	7	8	1	6	38	8	7	8	7	3	3	2	3	41
Montmorency	0	4	5	4	3	4	5	2	27	4	3	4	1	2	4	2	1	21
Ogemaw	10	3	4	7	4	3	7	4	42	8	8	2	3	3	4	2	3	33
Osceola	14	16	12	17	23	10	12	6	110	12	7	6	13	12	14	10	5	79
Oscoda	0	1	0	2	2	2	0	0	7	4	0	1	1	0	0	0	0	6
Otsego	5	3	4	5	1	2	3	2	25	6	5	2	4	3	1	2	4	27
Presque Isle	5	5	4	3	3	9	9	5	43	5	6	10	3	3	7	9	5	48
Roscommon	2	4	0	3	1	2	2	0	14	1	2	3	6	0	0	1	1	14
Wexford	14	17	15	18	14	10	15	8	111	15	14	10	6	18	5	10	10	88
III.—Central																		
Counties	**270**	**269**	**265**	**240**	**259**	**260**	**223**	**263**	**2,049**	**224**	**230**	**216**	**199**	**212**	**179**	**169**	**172**	**1,601**
Bay	14	20	20	14	25	19	12	28	152	16	18	15	17	10	17	12	16	121
Gratiot	25	22	21	36	23	25	25	29	206	18	22	19	19	25	13	17	17	150
Huron	18	27	30	25	24	24	25	25	198	31	24	17	20	28	19	16	28	183
Isabella	25	16	18	12	14	19	12	20	136	23	22	18	12	19	11	12	6	123
Mecosta	16	13	16	19	12	13	14	16	119	17	11	13	9	16	11	8	13	98
Midland	14	11	8	5	7	17	10	10	82	5	11	14	14	10	8	10	7	79
Montcalm	30	35	26	17	29	14	31	27	209	23	20	30	13	21	21	9	14	151
Muskegon	10	12	15	11	10	16	6	10	90	8	18	9	10	5	9	13	4	76
Newaygo	11	14	13	9	15	17	7	12	98	14	11	11	13	7	10	8	5	79
Oceana	17	10	12	13	17	15	10	14	108	13	16	11	8	13	9	11	12	93
Saginaw	33	28	30	28	33	20	14	20	206	21	16	21	24	23	21	17	18	161
Sanilac	29	20	31	27	23	36	24	33	223	14	17	18	16	15	10	19	12	121
Tuscola	28	41	25	24	27	25	33	19	222	21	24	20	24	20	20	17	20	166
IV.—Southern																		
Counties	**794**	**758**	**696**	**681**	**775**	**750**	**743**	**786**	**5,983**	**688**	**666**	**696**	**724**	**669**	**687**	**722**	**791**	**5,643**
Allegan	43	40	37	23	33	32	27	29	264	20	28	40	30	20	28	19	24	209
Barry	15	11	19	16	17	18	13	21	130	9	13	5	10	12	10	3	8	70
Berrien	28	41	42	30	47	33	48	47	319	45	47	43	46	47	31	37	48	347
Branch	25	21	17	21	22	17	21	18	162	17	15	16	16	16	11	16	11	118
Calhoun	25	18	25	15	30	28	25	23	189	12	19	15	15	22	21	15	27	146
Cass	16	20	21	15	20	18	24	15	149	19	17	18	13	14	11	13	18	123
Clinton	26	16	16	18	19	20	20	24	159	11	11	8	17	10	10	7	5	79
Eaton	25	18	21	25	30	27	37	27	210	28	25	32	18	13	12	13	8	149
Genesee	16	17	30	25	15	23	18	16	160	20	15	12	13	15	17	12	16	120
Hillsdale	29	22	15	25	30	22	25	23	191	25	17	20	18	11	13	17	24	145
Ingham	20	21	11	20	17	15	16	12	132	14	12	14	14	4	10	12	11	91
Ionia	39	34	25	21	30	34	33	26	242	20	29	17	27	27	17	20	17	174
Jackson	13	16	13	10	12	16	9	12	101	14	10	7	16	8	10	7	15	87

TABLE NO. 3.—*Concluded.*

Counties by geographical sections.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	Total deaths, 1900–1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	Total deaths, 1908–1915.
IV.—Southern Counties.—Con.																		
Kalamazoo	14	16	11	15	14	15	12	13	110	11	10	14	18	9	10	7	8	87
Kent	42	32	35	44	26	40	41	45	305	60	41	48	55	50	62	63	45	424
Lapeer	23	29	12	11	19	17	15	20	146	21	17	20	10	19	21	19	24	151
Lenawee	37	35	34	26	33	23	32	34	254	22	27	19	24	22	13	23	27	177
Livingston	22	17	17	17	11	13	11	18	126	15	13	15	15	32	22	19	17	148
Macomb	37	36	33	18	36	23	25	28	236	32	25	35	24	17	18	21	27	199
Monroe	30	27	22	29	29	34	28	30	229	27	17	26	30	20	21	19	16	176
Oakland	42	36	25	26	26	24	27	23	229	28	23	11	26	15	18	14	24	159
Ottawa	35	31	33	29	39	38	33	37	275	40	23	30	42	35	31	19	27	247
St. Clair	25	16	24	25	18	26	14	40	188	33	20	32	16	27	22	16	18	184
St. Joseph	19	27	23	18	23	24	14	19	167	15	18	18	14	12	13	12	12	114
Shiawassee	36	31	28	27	30	31	34	31	248	19	24	25	16	12	17	16	15	144
Van Buren	28	33	15	24	30	21	27	30	208	21	22	19	24	16	12	34	13	161
Washtenaw	22	26	24	32	35	30	20	36	225	13	28	22	20	12	21	14	16	146
Wayne	62	68	68	76	84	88	94	89	629	77	100	115	137	152	182	235	270	1,268

TABLE NO. 3A.—*Showing the death rates per 100,000 population from pulmonary tuberculosis for the State of Michigan, for the urban districts (cities of 10,000 inhabitants and over) and for the rural districts (cities of less than 10,000 inhabitants and all villages and townships), also the death rates from this disease for the rural districts in each county, during each of the years, 1900-1915.*

State and counties by geographical sections.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	Annual average, 1900–1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	Annual average, 1908–1915.
STATE (Urban and rural localities)....	**90.0**	**87.9**	**83.2**	**84.0**	**89.4**	**86.3**	**87.9**	**85.8**	**86.8**	**81.9**	**80.5**	**82.5**	**81.5**	**80.2**	**77.4**	**79.7**	**84.8**	**81.0**
URBAN DISTRICTS (Cities of 10,000 inhabitants and over)	**103.0**	**101.0**	**97.5**	**96.5**	**101.6**	**94.7**	**96.1**	**95.9**	**97.9**	**92.8**	**86.7**	**96.1**	**94.2**	**93.5**	**90.2**	**89.1**	**101.6**	**93.1**
RURAL DISTRICTS	**84.4**	**82.2**	**76.6**	**78.0**	**84.1**	**81.9**	**83.0**	**80.3**	**81.3**	**75.8**	**77.0**	**74.5**	**74.0**	**72.0**	**69.4**	**73.2**	**73.8**	**73.7**
I.—Upper Peninsula Counties..........	**82.2**	**83.8**	**75.2**	**89.6**	**83.1**	**93.4**	**111.8**	**75.7**	**87.1**	**85.8**	**95.6**	**74.9**	**76.8**	**86.3**	**80.8**	**93.6**	**79.2**	**84.0**
Alger..........	68.0	82.4	48.0	124.4	75.6	58.8	43.0	41.9	67.1	40.8	39.8	38.9	50.7	74.3	48.4	71.0	58.0	53.2
Baraga..........	46.1	155.0	85.1	102.4	138.1	171.4	257.7	35.6	125.6	138.0	100.3	16.2	94.5	61.2	104.3	72.5	56.5	79.6
Chippewa........	55.5	73.3	63.5	80.9	71.2	97.0	113.5	43.3	75.0	85.7	84.9	59.0	25.0	82.7	57.4	56.9	48.3	62.3
Delta..........	69.7	68.4	73.9	79.3	51.9	44.7	94.2	80.3	70.4	66.9	113.7	64.8	110.3	22.9	62.0	72.2	54.7	70.6
Dickinson.......	72.6	99.0	92.2	58.8	73.8	103.9	117.9	60.7	84.9	64.9	113.2	58.3	72.0	85.3	84.2	92.4	73.0	80.4
Gogebic.........	42.5	107.9	38.6	147.8	59.0	34.0	54.5	94.5	72.3	91.1	97.8	103.9	109.7	88.6	103.1	91.7	170.1	108.0
Houghton.......	90.6	90.5	89.1	97.3	102.4	104.6	134.4	83.1	99.4	90.4	105.4	88.1	77.1	84.9	76.6	103.6	73.2	87.2
Iron............	22.1	62.1	68.0	9.2	43.3	57.5	86.0	37.3	49.1	106.8	40.9	32.7	50.3	36.3	46.6	89.9	54.3	57.0
Keweenaw......	123.1	27.4	49.4	45.0	144.5	133.5	88.6	49.7	83.4	93.2	58.5	124.3	91.7	62.2	83.0	22.6	65.0	73.4
Luce...........	100.3	64.6	156.3	181.7	88.1	114.0	221.5	188.4	141.6	157.1	178.5	273.2	96.9	236.3	253.7	315.4	154.1	209.3
Mackinac.......	142.6	139.7	124.5	122.2	120.0	176.5	104.0	136.2	133.1	111.5	153.4	75.4	95.4	125.1	92.3	80.7	69.5	99.8
Marquette......	105.7	65.0	63.3	82.3	50.2	88.1	90.8	93.4	80.0	68.5	93.8	52.4	98.4	159.2	131.3	120.7	145.9	110.0
Menominee.....	70.2	27.9	55.5	110.2	61.6	81.6	54.1	40.3	62.7	53.4	66.4	79.2	52.5	110.8	64.8	109.5	32.0	70.3
Ontonagon......	32.2	139.2	29.8	100.5	124.8	107.2	116.8	75.4	91.7	146.3	94.6	68.9	33.5	43.5	10.6	......	80.5	57.9
Schoolcraft......	152.0	75.2	24.8	61.5	60.9	48.2	107.4	94.6	78.0	70.3	58.0	57.5	91.1	45.2	100.7	99.8	98.9	78.0
II.—Northern Counties..........	**78.1**	**76.4**	**71.8**	**84.6**	**86.2**	**73.0**	**80.1**	**63.6**	**76.7**	**75.2**	**79.6**	**76.7**	**67.8**	**62.4**	**55.5**	**58.5**	**51.1**	**65.6**
Alcona.........	70.3	87.8	52.7	105.4	87.8	87.8	70.2	52.6	76.8	35.1	122.8	105.2	17.5	35.1	70.1	52.6	35.0	59.2
Alpena.........	92.9	91.7	75.5	59.7	132.6	29.1	57.6	42.7	72.3	84.4	69.5	82.5	68.0	67.2	53.2	26.3	65.1	64.2
Antrim.........	84.5	60.7	48.8	61.4	55.5	80.7	87.3	81.6	70.0	44.2	69.8	38.3	77.0	38.7	32.5	71.8	59.1	53.9
Arenac.........	50.9	20.4	61.3	51.2	92.4	30.8	72.1	31.0	51.3	51.7	82.9	103.8	83.2	10.4	73.1	52.3	62.9	65.0
Benzie..........	61.9	153.2	101.2	150.3	89.3	108.1	136.3	125.4	115.9	66.9	123.1	56.3	93.0	36.9	54.8	90.6	44.9	70.6
Charlevoix......	78.6	82.6	106.3	115.5	118.0	66.1	93.2	67.9	90.7	82.4	90.7	98.6	75.8	49.2	76.7	70.2	54.8	74.2
Cheboygan......	45.1	82.4	43.7	80.0	66.7	101.6	106.1	81.4	76.4	57.3	73.5	72.5	66.1	59.8	75.1	84.8	73.2	70.4

TABLE NO. 3A.—*Concluded.*

Counties by geographical sections.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	Annual average, 1900–1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	Annual average, 1908–1915.
II.—Northern Counties.—Con.																		
Clare	83.7	59.1	58.5	104.2	80.2	22.7	56.2	77.9	67.7	55.1	76.3	43.2	32.1	74.2	31.5	31.2	51.5	49.2
Crawford	33.8	32.8	63.5	30.8	89.5	29.0	28.1	82.1	49.2	26.6	......	151.7	98.6	72.2	70.5	23.0	67.3	63.9
Emmet	75.2	104.8	109.2	95.5	105.8	104.1	74.1	56.1	90.3	116.1	98.1	80.6	100.6	109.7	92.7	66.1	35.1	86.8
Gladwin	76.0	29.6	43.1	42.0	13.6	66.5	129.8	76.0	60.5	61.9	24.2	23.7	57.9	79.3	33.3	43.5	42.6	45.8
Grand Traverse	117.4	71.8	80.4	79.9	106.0	52.7	69.9	78.3	81.9	86.5	77.4	94.2	85.2	50.8	50.6	41.9	25.0	63.7
Iosco	78.1	58.9	88.7	118.9	109.5	60.0	40.2	70.8	78.2	71.1	153.2	51.3	41.3	72.6	41.7	73.4	84.3	73.7
Kalkaska	42.0	110.5	27.3	80.7	53.1	131.1	129.4	38.3	76.8	75.7	137.2	98.6	48.7	60.2	23.8	47.0	69.7	69.6
Lake	80.7	80.7	80.7	60.6	101.0	20.2	101.1	101.1	78.3	121.4	101.2	101.2	40.5	101.3	60.8	60.8	60.8	81.0
Leelanau	85.3	56.8	94.6	104.1	141.8	75.6	103.9	103.8	95.8	160.4	122.6	150.8	84.8	47.1	75.3	94.1	56.4	98.9
Manistee	117.6	36.6	80.0	57.9	79.2	114.6	64.1	78.0	78.5	28.2	77.2	139.6	97.3	103.7	61.9	82.1	61.3	81.4
Mason	111.1	119.7	71.8	70.7	99.5	83.3	82.1	66.7	87.7	84.5	60.2	91.3	85.6	97.8	61.4	69.3	77.0	78.3
Missaukee	21.5	10.6	62.6	72.1	71.1	80.2	9.9	58.6	48.5	77.1	66.7	75.2	65.0	27.5	27.2	17.9	26.6	47.3
Montmorency	......	121.6	149.6	117.8	87.0	114.2	140.7	55.4	98.6	109.3	80.8	106.2	26.2	51.7	101.9	50.3	24.8	68.5
Ogemaw	128.6	38.0	50.0	86.2	48.6	35.9	82.7	46.6	64.2	92.0	90.8	22.4	33.2	32.7	43.1	21.3	31.5	45.3
Osceola	78.4	89.6	67.2	95.1	128.7	55.9	67.1	33.6	76.9	67.1	39.1	33.5	72.7	67.1	78.2	55.9	27.9	55.2
Oscoda	......	65.4	......	121.8	117.7	113.9	......	......	52.4	207.8	......	49.0	47.7	......	......	......	......	35.3
Otsego	81.0	48.3	64.0	79.5	15.8	31.4	46.8	31.0	49.5	92.5	76.7	30.5	60.6	45.2	15.0	29.8	59.3	51.0
Presque Isle	56.5	55.0	42.9	31.3	30.5	89.4	87.2	47.3	55.4	46.3	54.3	88.5	26.0	25.4	58.2	73.3	39.9	51.4
Roscommon	111.7	217.4	......	154.8	50.3	98.2	95.9	......	89.1	45.8	89.5	131.3	257.2	......	......	40.3	39.5	74.2
Wexford	82.9	98.4	84.9	99.6	75.8	53.0	77.9	40.7	76.0	74.8	68.4	48.0	28.2	83.2	22.7	44.6	43.8	51.3
III.—Central Counties	**80.2**	**79.8**	**78.7**	**71.3**	**76.9**	**77.2**	**66.2**	**78.1**	**76.0**	**66.5**	**68.3**	**64.1**	**59.1**	**62.9**	**53.1**	**50.1**	**51.0**	**59.4**
Bay	64.7	91.8	91.2	63.4	112.5	84.9	53.3	123.5	85.8	70.1	78.4	64.9	73.1	42.7	72.2	50.7	67.1	64.9
Gratiot	83.7	73.9	70.8	121.8	78.1	85.2	85.5	99.6	87.3	62.0	76.1	66.0	66.2	87.5	45.7	59.9	60.2	65.5
Huron	52.7	78.9	87.5	72.8	69.7	69.6	72.4	72.3	72.0	89.5	69.2	48.9	57.4	80.2	54.4	45.7	79.8	65.6
Isabella	109.7	70.1	78.8	52.5	61.2	82.9	52.3	87.1	74.3	100.0	95.6	78.1	52.0	82.3	47.6	51.9	25.9	66.7
Mecosta	77.4	63.2	78.3	93.5	59.5	64.8	70.2	80.8	73.5	86.3	56.2	66.9	46.6	83.4	57.7	42.2	69.1	63.6
Midland	97.0	76.4	55.8	35.0	49.1	119.6	70.6	70.8	71.8	35.5	78.4	100.0	100.3	71.9	57.7	72.4	50.8	70.9
Montcalm	91.6	107.1	79.7	52.2	89.3	43.2	95.9	83.7	80.4	71.4	62.3	93.6	40.6	65.8	65.9	28.3	44.2	59.1
Muskegon	61.6	73.8	92.1	67.4	61.2	97.7	36.6	60.9	68.9	48.6	109.2	54.5	60.4	30.2	54.2	78.1	24.0	57.3
Newaygo	62.2	78.5	72.2	49.6	81.9	92.0	37.6	63.9	67.2	73.9	57.6	57.1	67.0	35.8	50.7	40.2	25.0	50.7
Oceana	102.0	59.4	70.5	75.6	97.9	85.5	56.5	78.3	78.2	72.0	87.7	59.7	43.0	69.3	47.5	57.5	62.2	62.2
Saginaw	84.9	72.0	77.2	72.1	85.0	51.5	36.1	51.5	66.3	54.1	41.3	54.2	61.9	59.3	54.2	43.9	46.5	51.9
Sanilac	82.7	57.3	89.0	77.8	66.5	104.4	69.8	96.4	80.5	41.0	50.0	53.1	47.3	44.5	29.8	56.8	36.0	44.8
Tuscola	78.0	114.6	70.1	67.4	76.1	70.6	93.5	54.0	78.1	59.8	68.6	57.3	69.0	57.6	57.8	49.3	58.1	59.7

IV.—Southern Counties	**88.4**	**84.4**	**77.5**	**75.8**	**86.4**	**83.6**	**82.8**	**87.7**	**83.3**	**76.7**	**74.3**	**77.7**	**80.8**	**76.6**	**76.7**	**80.7**	**88.4**	**78.7**
Allegan	110.8	102.8	94.8	58.8	84.1	81.4	68.5	73.4	84.2	50.5	70.5	100.0	75.1	49.9	69.7	47.2	59.5	65.3
Barry	66.6	48.8	84.3	71.0	75.3	79.7	57.6	92.9	72.0	39.8	57.5	22.1	44.2	53.0	44.1	13.2	35.3	38.6
Berrien	56.9	88.6	83.8	59.3	92.1	64.1	92.5	89.8	78.5	85.2	88.2	80.1	84.9	86.1	61.8	66.6	85.8	79.7
Branch	90.0	76.2	62.2	77.4	81.8	63.7	79.4	68.6	75.0	65.4	58.2	62.6	63.2	63.7	44.2	64.9	45.0	58.5
Calhoun	81.3	58.4	81.0	48.5	96.8	90.1	80.3	73.7	76.3	38.4	60.7	47.8	47.7	69.8	66.5	47.4	85.2	58.0
Cass	76.7	95.9	100.9	72.1	96.3	86.8	115.8	72.5	89.6	91.9	82.3	87.3	63.1	68.1	53.5	63.4	87.8	74.7
Clinton	103.5	64.2	61.7	73.4	78.2	83.0	83.7	101.3	81.4	46.8	47.2	34.7	74.3	44.1	44.5	31.4	22.7	43.3
Eaton	79.0	57.1	66.8	79.9	96.2	86.9	119.6	87.6	84.0	91.2	81.7	105.0	59.3	43.0	39.8	43.3	26.8	61.5
Genesee	55.8	59.8	106.6	89.7	54.4	84.2	66.6	59.8	72.1	75.5	57.2	46.2	50.6	59.1	67.7	48.3	65.1	58.7
Hillsdale	97.1	73.7	50.3	83.9	100.7	73.9	84.0	77.4	80.1	84.2	57.3	67.4	60.7	37.1	43.9	57.4	81.2	61.2
Ingham	85.8	90.5	47.7	87.2	74.5	66.1	70.9	53.5	72.1	62.8	54.1	63.5	63.8	18.3	46.1	55.7	51.4	52.0
Ionia	113.6	99.3	73.2	61.6	88.2	100.2	97.5	77.0	88.9	59.4	86.3	50.7	80.7	80.9	51.1	60.2	51.3	65.1
Jackson	56.4	69.8	57.0	44.0	53.1	71.1	40.2	53.8	55.7	63.1	45.3	31.9	73.2	36.8	46.2	32.5	70.0	49.9
Kalamazoo	70.3	79.9	54.6	74.1	68.8	73.3	58.3	62.9	67.8	52.9	47.8	66.7	85.2	42.4	46.9	32.6	37.1	51.4
Kent	99.6	75.1	81.2	101.1	59.1	90.0	91.4	99.3	87.1	131.1	88.7	102.9	116.7	105.1	129.1	130.0	92.0	112.0
Lapeer	83.3	105.6	43.9	40.5	70.4	63.4	56.3	75.5	67.5	79.8	65.0	76.9	38.7	74.0	82.3	75.0	95.3	73.3
Lenawee	95.5	90.7	88.5	68.0	86.6	60.6	84.7	90.4	83.2	58.8	72.4	51.2	65.0	59.8	35.5	63.1	74.4	60.0
Livingston	112.0	87.4	88.3	89.2	58.3	69.6	59.5	98.5	83.1	82.9	72.7	84.8	85.7	184.9	128.6	112.3	101.7	106.3
Macomb	111.3	108.5	99.7	54.5	109.2	69.9	76.1	85.4	89.4	97.8	76.6	107.4	73.8	52.4	55.6	64.9	83.7	76.5
Monroe	91.6	82.4	67.1	88.4	88.4	103.5	85.2	91.3	87.2	82.1	51.7	79.0	91.1	60.7	63.7	57.6	48.5	66.8
Oakland	119.9	102.8	71.4	74.2	74.2	68.5	77.1	65.6	81.7	79.9	65.6	31.4	74.2	42.8	51.4	39.9	68.5	56.7
Ottawa	88.1	77.0	80.8	70.0	92.9	89.3	76.5	84.7	82.4	90.3	51.3	66.1	91.3	75.2	65.8	39.8	55.9	66.7
St. Clair	69.4	44.7	67.6	70.9	51.4	74.9	40.6	116.9	66.9	97.2	59.4	95.7	48.3	82.1	67.4	49.4	56.1	69.6
St. Joseph	79.5	112.2	94.9	73.8	93.7	97.1	56.3	75.9	85.3	59.5	70.9	70.5	54.5	46.4	50.0	45.8	45.5	55.3
Shiawassee	106.3	91.7	83.0	80.2	89.3	92.4	101.5	92.8	92.2	57.0	72.1	75.2	48.2	36.2	51.4	48.5	45.6	54.3
Van Buren	84.1	99.2	45.1	72.2	90.3	63.2	81.3	90.3	78.2	63.2	66.3	57.3	72.3	48.2	36.2	102.6	39.2	60.7
Washtenaw	66.2	79.1	73.7	99.4	109.8	95.2	64.1	116.7	87.8	42.6	92.8	73.8	67.8	41.2	72.9	49.2	56.9	62.3
Wayne	98.2	107.3	106.8	118.9	130.8	136.4	145.1	136.8	122.7	117.9	152.4	174.6	207.1	228.8	272.8	350.8	401.4	239.1

TABLE 4.—*Showing the number of deaths from pulmonary tuberculosis in each of the cities of Michigan having 10,000 or more inhabitants, during each of the years, 1900–1915.*

Cities.	1900.	1901.	1902.	1903.	1904.	1905	1906	1907	Total deaths, 1900–1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	Total deaths, 1908–1915.	Per cent increase (+) or decrease (−) between 1900 to 1907 and 1908 to 1915.
ALL CITIES	754	767	774	795	857	839	881	908	6,575	908	875	999	1,008	1,030	1,021	1,036	1,212	8,089	+23.0
Adrian	10	13	11	11	5	4	4	8	66	10	11	8	6	8	5	7	6	61	− 7.6
Alpena	10	10	5	12	4	10	9	6	66	16	15	8	16	16	7	8	9	95	+ 44.0
Ann Arbor	22	16	13	8	13	21	19	21	133	14	15	19	17	10	14	16	23	128	− 3.8
Battle Creek	18	20	20	26	25	34	21	19	183	24	17	17	19	21	17	23	28	166	− 9.3
Bay City	35	33	39	41	39	40	34	31	291	35	23	27	37	41	43	32	29	267	− 8.2
Detroit	323	324	349	333	377	347	409	397	2,859	391	387	465	487	500	513	557	658	3,958	+ 38.5
Escanaba	13	14	16	15	22	23	18	17	138	15	12	11	11	9	16	13	12	99	− 28.3
Flint	9	15	18	9	9	16	18	17	111	10	18	40	23	29	29	26	23	198	+ 78.4
Grand Rapids	82	86	92	107	116	74	81	98	739	82	95	115	101	91	66	84	107	741	+ 0.3
Ironwood	5	6	7	12	5	8	2	8	53	13	11	11	8	7	8	11	12	84	+ 58.5
Ishpeming	6	13	16	12	18	19	8	18	110	11	10	12	5	10	6	7	7	68	− 38.2
Jackson	23	21	20	27	25	35	27	28	206	29	24	24	28	22	29	28	33	217	+ 5.3
Kalamazoo	25	29	25	24	34	38	45	48	268	36	45	46	47	49	67	46	61	397	+ 48.1
Lansing	14	12	7	15	8	13	13	13	95	20	14	19	18	29	21	13	15	149	+ 56.8
Manistee	10	11	13	13	6	20	17	20	110	18	9	9	17	11	15	11	18	111	+ 0.9
Marquette	19	16	15	15	10	19	12	15	121	14	14	16	16	10	7	8	10	95	− 21.5
Menominee	10	11	8	18	7	8	8	5	75	10	10	6	6	8	8	13	11	72	− 4.0
Muskegon	22	26	20	16	28	16	26	24	178	29	23	20	29	26	23	24	32	206	+ 15.7
Pontiac	7	4	11	11	10	8	17	13	81	30	21	26	15	25	25	14	24	183	+125.9
Port Huron	22	14	12	8	10	11	15	15	107	15	12	13	18	15	14	17	13	117	+ 9.3
Saginaw	41	45	36	39	53	37	35	37	323	45	52	43	43	54	37	38	32	314	+ 6.5
Sault Ste. Marie	14	11	9	10	12	13	11	17	100	10	12	4	20	12	16	8	9	91	− 9.0
Traverse City	14	17	12	13	21	25	26	33	161	31	22	37	21	27	35	29	40	242	+ 50.3

TABLE 4A.—*Showing the death rates per 100,000 population from pulmonary tuberculosis in each of the cities of Michigan having 10,000 or more inhabitants, during each of the years, 1900–1915.*

Cities.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	Annual average, 1900–1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	Annual average, 1908–1915.	Per cent increase (+) or decrease (−) between 1900 to 1907 and 1908 to 1915.
ALL CITIES	103.0	101.0	97.5	96.5	101.6	94.7	95.1	95.9	97.9	92.8	86.7	96.1	94.2	93.5	90.2	89.1	101.6	93.1	− 4.9
Adrian	103.5	133.0	111.3	110.0	49.4	39.1	38.7	76.6	82.0	94.7	103.1	74.2	55.1	72.7	45.0	62.3	52.9	69.6	−15.1
Alpena	84.7	84.0	41.7	99.3	32.8	81.5	72.8	48.6	68.0	127.6	118.7	62.9	124.8	124.0	53.9	61.1	68.3	92.3	+35.7
Ann Arbor	151.6	110.0	89.2	54.8	88.8	143.2	129.3	142.6	113.7	94.8	101.4	128.2	114.4	67.2	93.8	107.0	153.5	107.6	− 5.4
Battle Creek	96.7	103.6	100.1	125.9	117.2	154.5	92.5	81.3	109.0	99.8	68.7	66.9	72.8	78.5	61.9	81.8	97.2	78.5	−28.0
Bay City	85.8	80.0	93.6	97.3	91.6	93.0	78.2	70.6	85.9	78.9	51.3	59.7	81.0	88.8	92.3	68.0	61.1	72.7	−15.4
Detroit	112.5	106.1	107.8	97.4	104.7	91.7	103.2	95.7	101.8	90.3	85.8	99.1	99.9	98.9	97.9	102.7	117.4	99.6	− 2.2
Escanaba	135.7	140.7	155.1	140.4	199.0	201.3	152.6	139.8	158.7	119.7	93.0	82.9	80.6	64.2	111.3	88.2	79.4	89.5	−43.6
Flint	67.6	94.4	97.4	42.8	38.1	61.1	62.5	51.2	62.1	29.5	49.3	102.3	55.2	65.5	61.9	52.6	44.2	57.6	− 7.2
Grand Rapids	93.4	95.2	99.1	112.2	118.5	73.7	81.6	92.9	95.6	75.9	85.9	101.7	87.3	77.0	54.7	68.2	85.1	79.2	−17.2
Ironwood	51.4	59.7	67.6	112.4	45.5	70.0	17.2	67.0	61.1	106.1	87.5	108.6	60.6	51.8	57.8	77.7	83.0	78.6	+28.6
Ishpeming	45.3	98.7	122.2	92.3	139.2	147.9	62.7	111.9	106.0	87.2	79.8	96.4	40.4	81.4	49.1	57.7	58.1	69.0	−34.9
Jackson	91.2	81.2	75.5	99.5	90.0	123.2	93.0	94.4	93.8	95.7	77.6	76.0	87.0	67.0	86.7	82.1	95.0	83.4	−11.1
Kalamazoo	101.9	111.3	90.7	82.5	111.0	118.2	133.7	136.4	112.2	98.1	117.7	115.7	113.9	114.5	151.2	100.3	128.8	118.1	+ 5.3
Lansing	84.3	66.3	35.7	71.1	35.4	54.0	50.8	48.0	54.4	70.0	46.6	60.2	54.5	84.0	58.3	34.7	38.5	55.1	+ 1.3
Manistee	70.2	78.3	93.7	95.0	44.5	150.2	129.5	151.6	101.2	141.1	71.6	72.7	139.4	91.6	126.9	120.3	157.2	114.7	+13.3
Marquette	188.7	156.6	144.8	142.7	93.9	175.9	109.6	135.2	142.9	124.6	123.0	138.7	137.0	84.6	58.5	66.0	81.5	101.0	−29.3
Menominee	78.1	87.5	64.8	148.6	58.9	68.7	70.0	44.7	78.2	91.2	93.1	57.1	58.4	79.6	81.5	135.6	117.5	88.6	+13.3
Muskegon	105.5	122.8	93.0	73.3	126.4	71.2	114.0	103.7	101.2	123.5	96.6	82.9	118.6	104.9	91.6	94.3	124.2	104.6	+ 3.4
Pontiac	71.4	38.9	102.1	97.7	85.2	65.5	133.8	98.6	88.1	219.5	169.6	177.7	99.2	160.3	155.5	84.5	140.8	149.0	+69.1
Port Huron	114.8	73.2	62.8	42.0	52.5	57.9	79.0	79.2	70.2	79.3	63.5	68.9	95.6	79.8	74.6	90.7	69.5	77.7	+10.7
Saginaw	96.7	104.1	81.6	86.9	115.9	79.5	73.9	76.8	89.1	91.8	104.3	84.8	83.5	103.2	69.6	70.4	58.4	82.8	− 7.1
Sault Ste. Marie	132.6	103.2	82.0	89.4	105.3	112.0	118.5	141.3	110.7	81.7	96.4	31.6	155.4	91.8	120.4	59.3	65.6	87.7	−20.8
Traverse City	148.5	175.2	120.3	126.8	199.5	231.5	234.8	290.8	193.7	266.7	184.9	304.0	168.7	212.3	269.4	218.6	295.4	240.4	+21.1

PULMONARY TUBERCULOSIS - PER CENT REDUCTION IN AVERAGE RATE OF 1908-1915 OVER RATE OF 1900-1907

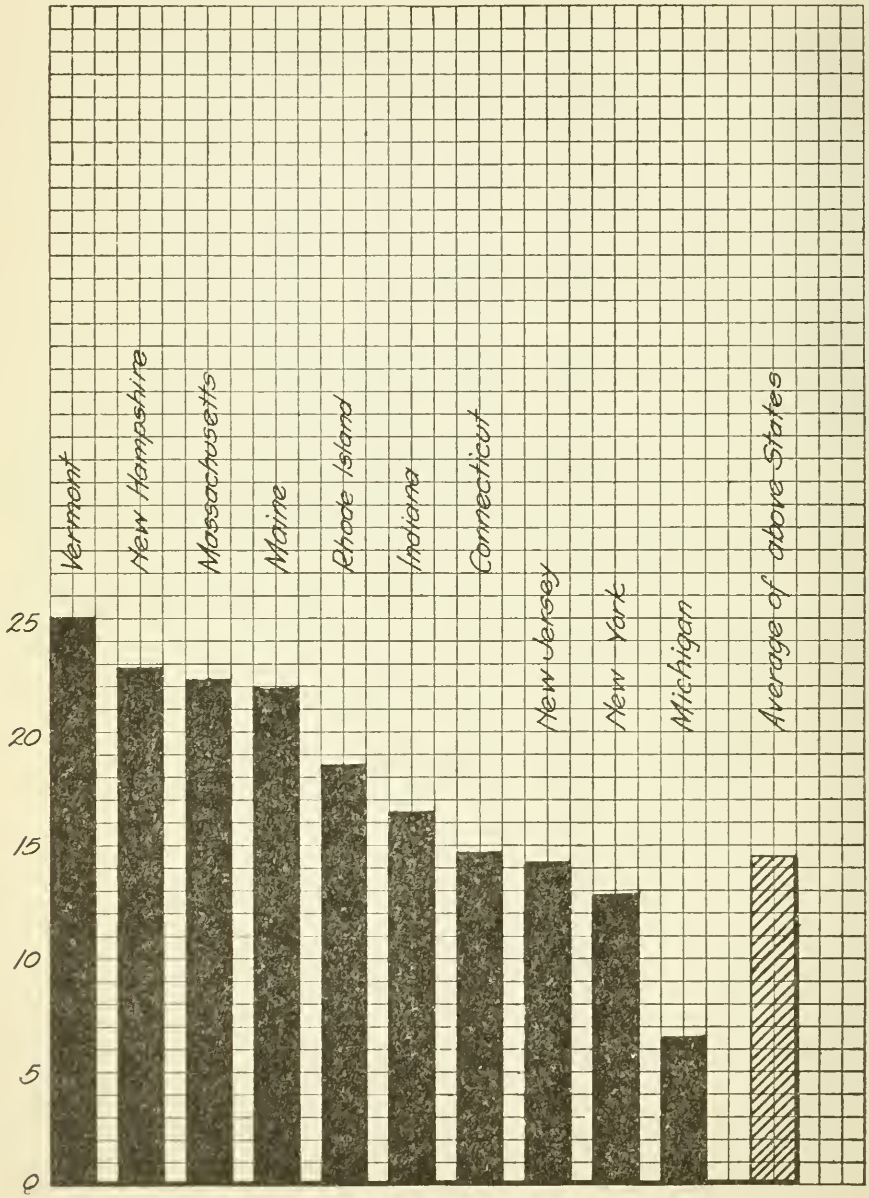
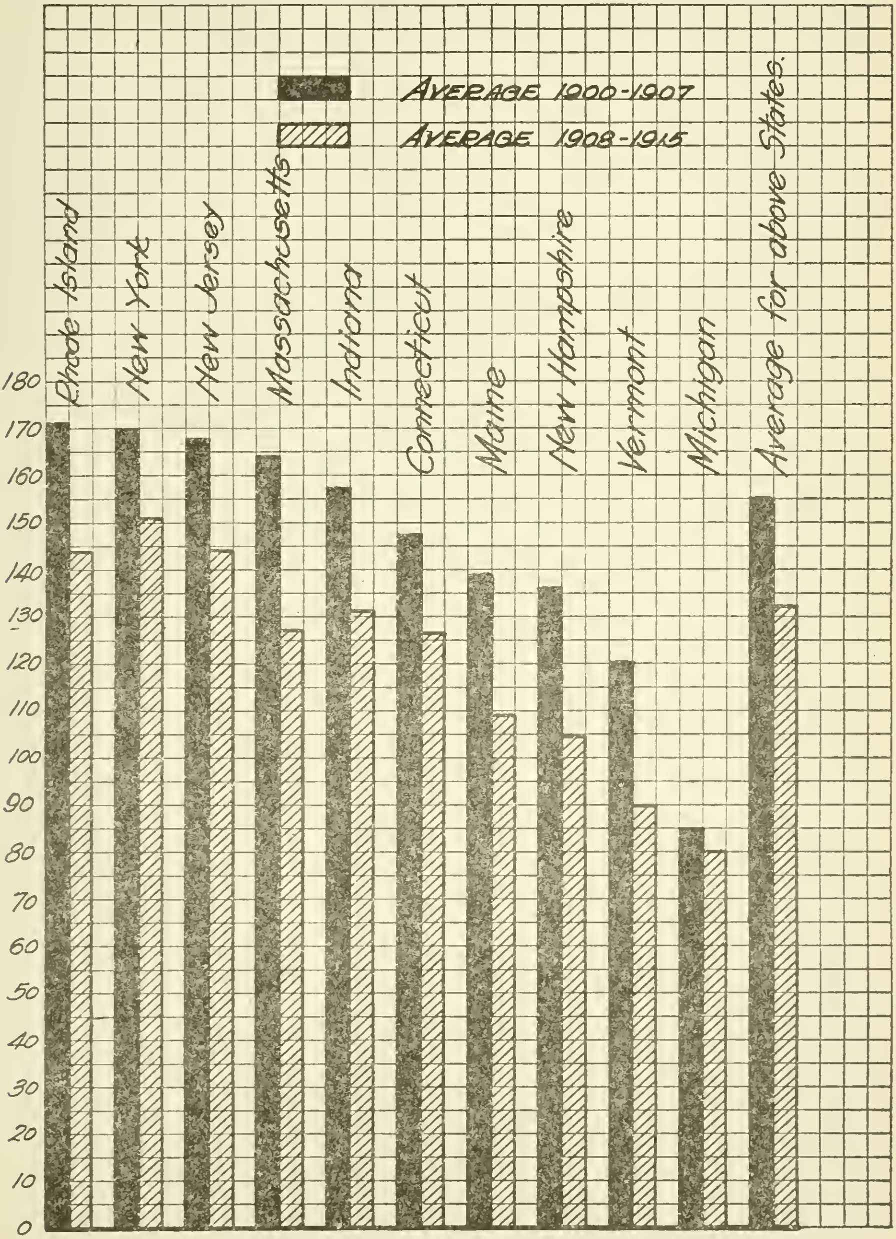


DIAGRAM SHOWING THE AVERAGE DEATH RATES FROM PULMONARY TUBERCULOSIS FOR TWO EIGHT YEAR PERIODS 1900-1907 AND 1908-1915, IN THE 1900 REGISTRATION AREA.



In Table 4A is shown the per cent of increase or decrease in the rates in each of the cities of the state having 10,000 or more inhabitants as between the two eight year periods. Thirteen of the 23 cities experienced reductions in their rates ranging from 43.6 per cent in the city of Escanaba, to 2.2 per cent in the city of Detroit. Ten cities show increases in their rates, ranging from 69.1 per cent in Pontiac to 1.3 per cent in Lansing.

AGE AND SEX DISTRIBUTION OF THE LIVING CASES OF TUBERCULOSIS (ALL FORMS), IN MICHIGAN, AS REPORTED AND ON RECORD IN THIS OFFICE AT THE CLOSE OF THE YEAR 1915, ALSO THE RELATIVE SUSCEPTIBILITY TO THE DISEASE AS BETWEEN THE SEXES OF ALL AGES, BETWEEN THE SEXES AT THE VARIOUS AGE GROUPS AND AS BETWEEN THE AGES OF THOSE OF THE SAME SEX.

In Table 5 is shown the age and sex distribution of the 6,391 living cases of tuberculosis, in Michigan, reported to and on record in this office at the close of the year 1915. Of the 6,391 cases, 3,541, or 55.5 per cent, were males and 2,850, or 44.5 per cent, were females. It will also be noted that 3,200, or 50.1 per cent, of these cases were among persons aged from 20 to 34 years.

By the data in the column captioned "Cases per 100,000 population of corresponding sex and age," may be determined the relative susceptibility to tuberculosis as between the sexes at all ages, between the sexes at the various age groups and as between those living at the various age groups of the same sex. The error in the data in these columns lies, as with the case rates of the various sections of the State, in the failure on the part of physicians to report recognized cases of tuberculosis, but as there is no reason to suspect that the failure to report recognized cases affects one sex or age group more than another, and while the ratio of cases to the population of each sex and age group may be too low generally, the relation of the case rates as between the sexes at all ages and at the various ages and as between the age groups of the same sex is strictly comparable.

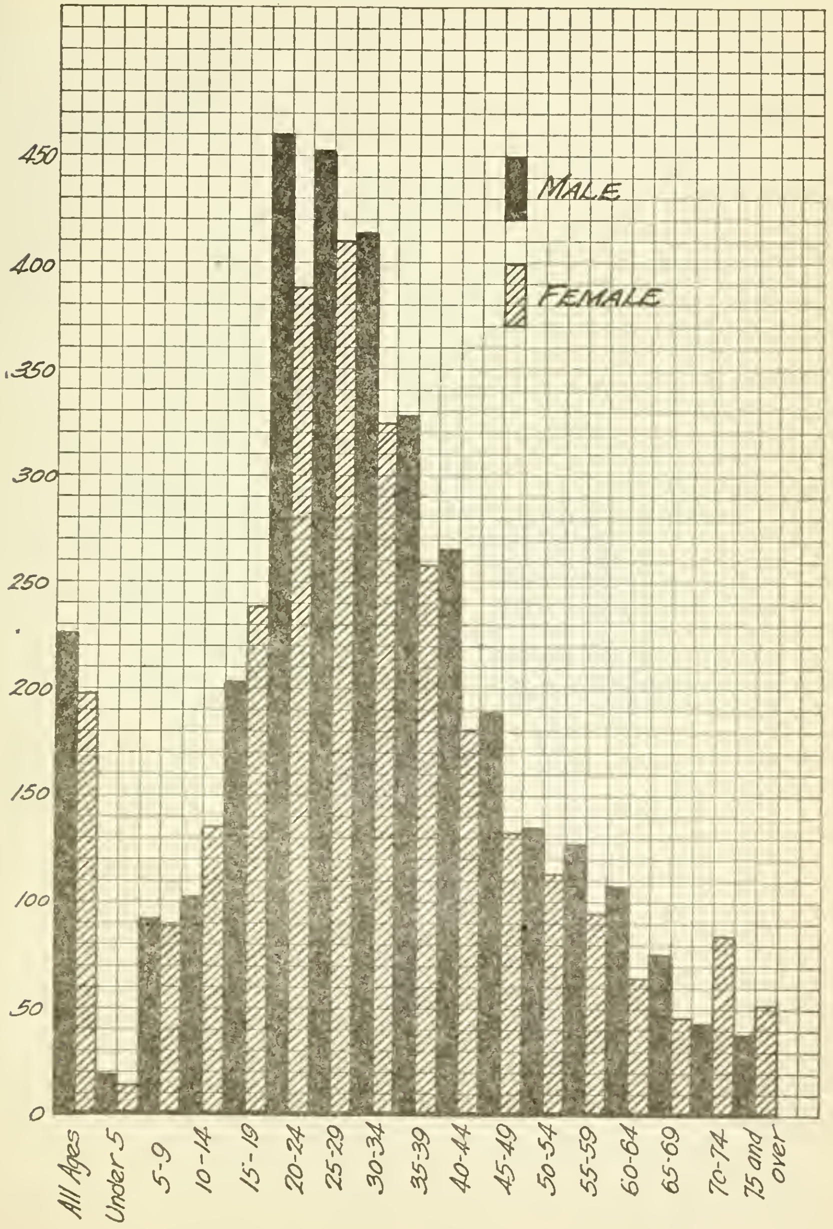
Based on the above mentioned cases, the males at all ages seem to experience a greater susceptibility to this disease than do females, their attack rates being 226.6 and 196.2 per 100,000 of their population, respectively. While this condition is also true at the ages under ten, still the difference is very slight. At the ages of from 10 to 20 years, the females show a greater susceptibility to tuberculosis than do the males at these ages, but after the 20th year of age up to the 70th year the males again show an excessive susceptibility, and after the 70th year the females again are more liable to have the disease than are males. It will also be noticed by these data that the maximum of susceptibility among the males is reached between the ages of from 20 to 24, while among the females the maximum is reached between the ages of from 25 to 29. Under five years of age the minimum of susceptibility occurs among both sexes.

While the data contained in Table 5 indicates that, at all ages, males are more susceptible to tuberculosis than are females at all ages, still after a careful analysis of the data, it would seem that the reverse was true. Under 10 years of age, when the degree of exposure to this disease as between the sexes is practically the same, the case rates are also practically the same. At the ages of from 10 to 20 years, or the school ages, and when there is no reason to believe that one sex is subjected to a greater degree of exposure than the other, the females show a greater susceptibility to the disease than do males. Between the ages of 20 and 70 years, there is no question but that the males are exposed to tuberculosis to a much greater extent than are the females by reason of their occupation, migratory habits and other environments, and it is at these ages when the males show excessive susceptibility to this disease as compared with the females of the same age. At the ages 70 years and over when the sexes would again be expected to experience the same degree of exposure, the females again show the higher case rates. Thus, eliminating the factor of exposure from the discussion, it would appear that females are constitutionally more susceptible to this disease than are males. The age of puberty will undoubtedly account for the excessive attack rates among females at the ages of between 10 and 20, but why the females of 70 years and over have this disease more frequently than men is problematical.

TABLE 5.—*Showing the age and sex distribution of the cases of tuberculosis (all forms) reported to the State Board of Health, and which were still living at the close of the year 1915, as indicated by the per cent of cases at each age group and of each sex to the total cases of all ages and of both sexes, also the number of cases per 100,000 population of Michigan of corresponding ages and sex in 1915.*

Age groups.	Living cases.			Per cent of total cases.			Cases per 100,000 population of corresponding sex and age.		
	Total.	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.
ALL AGES	6,391	3,541	2,850	100.0	55.5	44.5	210.0	226.6	196.2
Under 5 years	53	31	22	0.8	0.5	0.3	16.6	19.2	14.0
5–9 years	253	130	123	3.9	2.0	1.9	89.9	91.3	88.5
10–14 years	346	148	198	5.4	2.3	3.1	131.0	110.6	136.5
15–19 years	625	294	331	9.8	4.6	5.2	219.6	202.1	237.9
20–24 years	1,219	683	536	19.1	10.7	8.4	421.8	458.8	388.1
25–29 years	1,135	626	509	17.8	9.8	8.0	432.4	452.2	410.2
30–34 years	846	492	354	13.2	7.7	5.5	370.8	413.4	324.3
35–39 years	603	351	252	9.4	5.5	3.9	294.0	328.1	256.8
40–44 years	408	251	157	6.4	3.9	2.5	224.8	265.6	180.4
45–49 years	271	166	105	4.2	2.6	1.6	162.3	188.9	132.8
50–54 years	190	110	80	3.0	1.7	1.3	124.8	135.4	112.8
55–59 years	126	77	49	2.0	1.2	0.8	112.0	125.9	95.5
60–64 years	85	57	28	1.3	0.9	0.4	92.2	116.6	64.6
65–69 years	50	30	20	0.8	0.5	0.3	67.2	76.7	56.7
70–74 years	31	11	20	0.5	0.2	0.3	63.2	43.2	84.7
75 years and over	23	10	13	0.4	0.2	0.2	44.5	38.0	51.1
Unknown ages	127	74	53	2.0	1.2	0.8	....	....	....

TUBERCULOSIS – SUSCEPTIBILITY AS BETWEEN THE SEXES, AND AS BETWEEN THE AGES OF THOSE OF THE SAME SEX. BASED ON THE 6391 LIVING CASES IN MICHIGAN AT THE CLOSE OF THE YEAR 1915



While, as previously stated, the annual average death rate for the state as a whole decreased 6.7 per cent as between the two periods, 1900-1907 and 1908-1915, there were sections that showed much greater declines in their rates. The following table shows the average rate for each of the sections of the state for the two periods, together with the percentage of reduction in the rates:

Sections.	Annual average death rate 1900–1907.	Annual average death rate 1908–1915.	Per cent decrease between 1900–1907 and 1908–1915.
STATE	86.8	81.0	6.7
TOTAL URBAN DISTRICTS	97.9	93.1	4.9
TOTAL RURAL DISTRICTS	81.3	73.7	9.3
Upper Peninsula section	87.1	84.0	3.6
Northern section	76.7	65.6	14.5
Central section	76.0	59.4	21.8
Southern section	83.3	78.7	5.5

While the Upper Peninsula and Southern Section of counties show less decreases in their rates than for the state as a whole, if Wayne County is eliminated from the calculation, the Southern Section of counties would show a reduction of 17.9 per cent in the average rate of the latter period over that of the earlier. By eliminating all of Wayne county from the balance of the state in calculating the death rate for the state, the death rate for the period 1900-1907 would have been 83.2 and 72.5 for the period, 1908-1915, or a decrease of 12.9 per cent in the rate of the latter period over that of the former.

AGE DISTRIBUTION OF FATAL CASES OF PULMONARY TUBERCULOSIS, IN MICHIGAN, DURING THE YEARS, 1900 TO 1915.

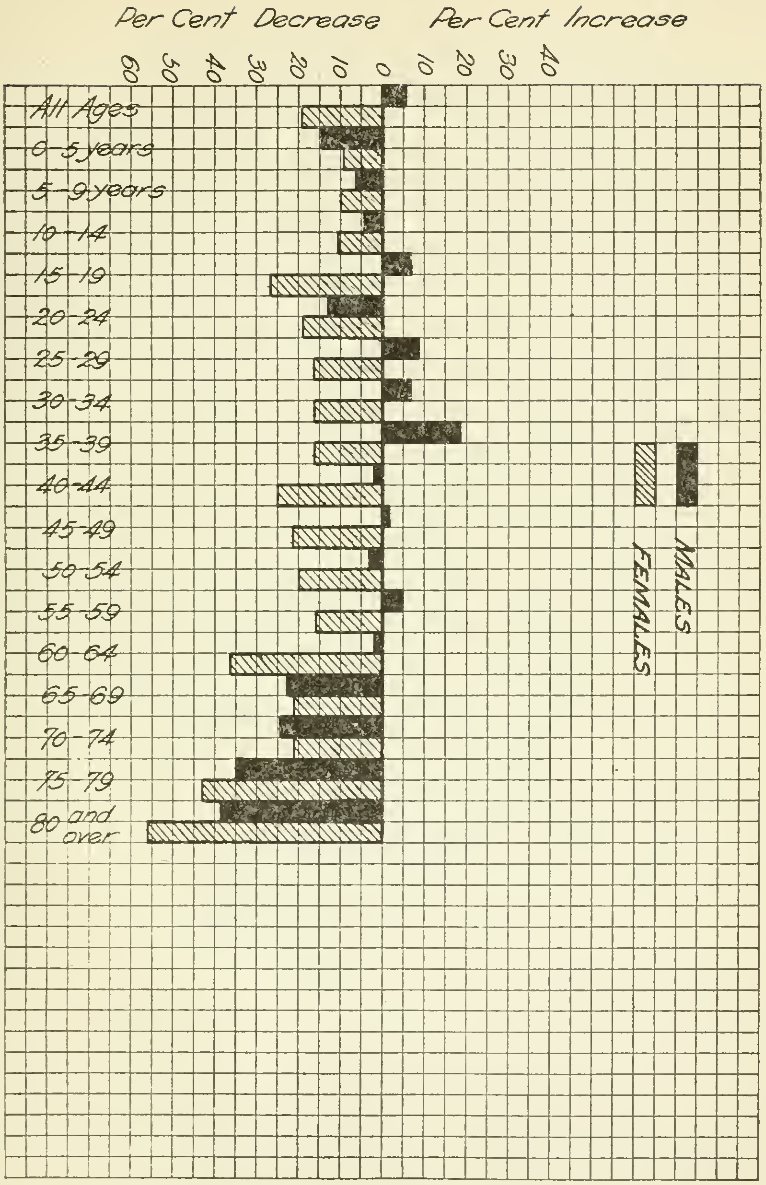
In Table 6 is shown the age distribution of the fatal cases of pulmonary Tuberculosis and in Table 6A is shown the ratio of deaths at the various age groups to the population of corresponding ages.

As indicated by the annual average death rates for the period, 1900-1907, the minimum death rate was recorded at the age group 5-9 years, when the same was 6.5 per 100,000 population of that age. The maximum death rate for this period occurs at the age group 20-29 years, the rate being 155.5 per 100,000 population of that age. During the period, 1908-1915, the minimum and maximum rates still occurred at the ages named, but with a substantial decrease in the maximum rate while the minimum rate remains practically stationary.

In the first period of years the death rates, beginning at the age group 5-9 years, increase with the advancement of age up to the age group 20-29, when the rates decline steadily up to the 60th year of age when the rate again increases up to the 80th year. Comparing the rates that occurred in the latter period with those of the earlier period and it will be seen that those aged 70-79 experienced a death rate from 1900-1907 that was higher than the rates for the groups ranging from 40 to 70 years, but that in the later period a large reduction is noted in the rate of this age group so that it was below the rate at the groups ranging from 40 to 70 years. It will also be seen that the death rates at each age group declined during the latter period compared with the earlier with but one exception—age group 5-9—where a slight increase is noted in the rate. The per cent reduction in the rates are: Under 5 years of age the death rate decreased 20.7 per cent; 10-19 years, 12.0; 20-29 years, 8.0; 30-39 years, 0.7; 40-49 years, 9.9; 50-59 years, 2.8; 60-69 years, 14.9; 70-79 years, 25.2 and at 80 years of age and over, 42 per cent.

TABLE 6.—*Showing the deaths from pulmonary tuberculosis in Michigan, by age groups, during each of the years, 1900–1915.*

Years.	All ages.	Under 5 years.	5–9 years.	10–19 years.	20–29 years.	30–39 years.	40–49 years.	50–59 years.	60–69 years.	70–79 years.	80 years and over.	Unknown.
1900	2,183	71	16	253	699	456	281	180	144	70	12	1
1901	2,165	56	19	289	627	437	292	216	142	70	16	1
1902	2,083	52	14	230	676	432	283	177	123	82	13	1
1903	2,136	62	17	252	675	432	269	193	145	67	16	8
1904	2,309	54	10	304	740	471	299	190	145	65	18	10
1905	2,261	59	17	261	739	484	319	180	116	64	13	6
1906	2,329	77	25	271	743	460	306	212	155	63	17	0
1907	2,316	56	22	260	713	498	311	197	169	75	13	2
Total, 1900–1907	17,782	487	140	2,123	5,612	3,673	2,360	1,545	1,139	556	118	29
1908	2,213	50	23	260	726	460	271	215	149	73	12	4
1909	2,238	49	14	266	706	510	289	200	134	60	7	3
1910	2,325	69	17	262	764	483	300	201	155	59	12	3
1911	2,330	56	16	268	744	518	292	211	141	70	11	3
1912	2,321	48	22	216	735	494	322	241	149	53	11	3
1913	2,273	59	21	223	744	481	303	230	135	59	8	10
1914	2,364	53	16	222	727	568	342	225	135	61	11	4
1915	2,556	46	18	258	800	610	312	266	164	68	11	3
Total, 1908–1915	18,653	430	147	2,005	5,946	4,121	2,431	1,789	1,162	503	83	33

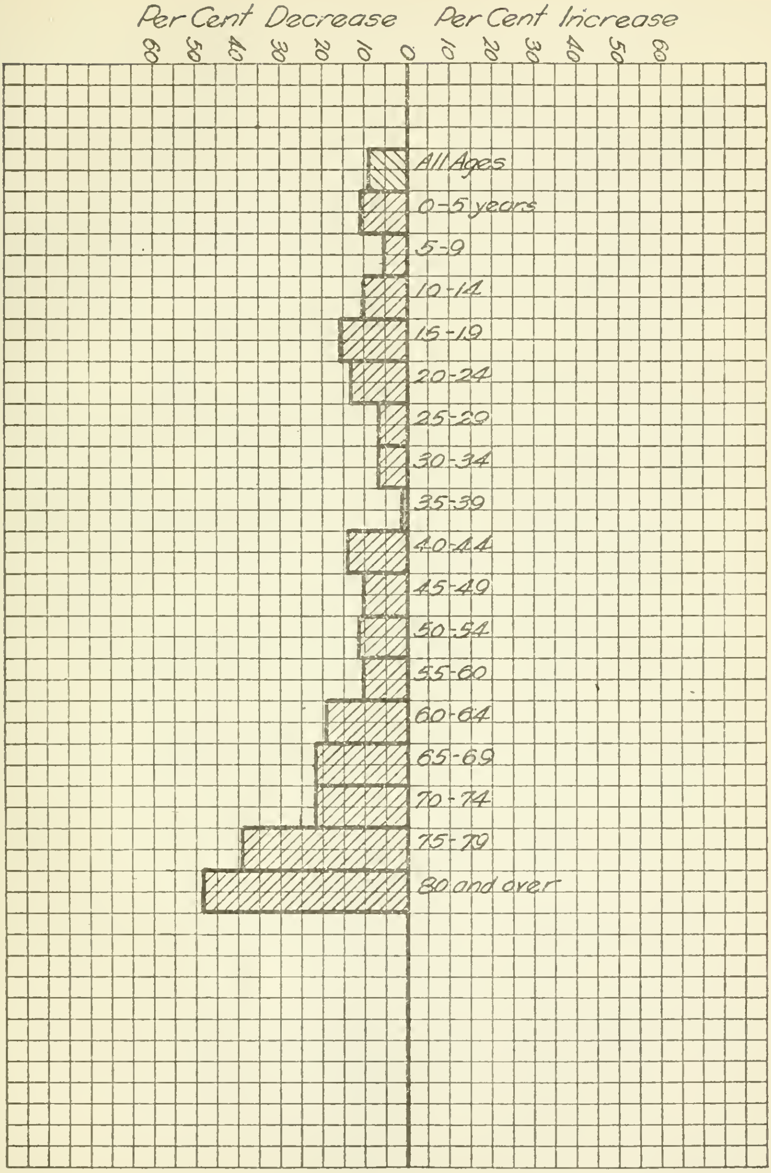


PULMONARY TUBERCULOSIS

DIAGRAM SHOWING THE PER CENT INCREASE OR DECREASE IN THE AVERAGE ANNUAL DEATH RATES PER 100,000 POPULATION, FOR EACH SEX AT VARIOUS AGE GROUPS, FOR THE YEARS 1908-1914 COMPARED TO 1898-1907, BASED ON MICHIGAN STATISTICS.

TABLE 6A. *Showing the death rates, by age groups, per 100,000 population of corresponding ages, from pulmonary tuberculosis, in Michigan, during each of the years, 1900–1915.*

Years.	All ages.	Under 5 years.	5–9 years.	10–19 years.	20–29 years.	30–39 years.	40–49 years.	50–59 years.	60–69 years.	70–79 years.	80 years and over.
1900	90.0	27.2	6.0	52.6	165.9	132.6	103.9	94.6	121.7	126.5	80.7
1901	87.9	21.1	7.2	59.5	145.9	124.9	105.9	110.6	116.9	122.9	104.6
1902	83.2	19.4	5.3	46.9	151.2	121.4	100.8	88.4	98.6	110.1	82.6
1903	81.0	22.7	6.3	50.9	151.0	116.6	90.9	94.1	113.3	111.4	98.9
1904	89.4	19.5	3.7	60.9	162.5	128.9	102.7	90.4	110.5	105.3	108.3
1905	86.3	21.1	6.3	52.4	159.3	129.5	107.6	83.7	86.3	101.0	76.2
1906	87.9	27.1	9.2	53.3	157.2	121.2	101.4	96.3	112.6	97.0	97.2
1907	85.8	19.5	8.1	50.7	148.2	129.1	101.4	87.5	120.0	112.7	72.5
Annual average, 1900–1907	86.8	22.2	6.5	53.4	155.5	125.9	102.2	93.0	109.9	114.1	89.9
1908	81.9	17.1	8.4	50.3	148.3	117.5	86.8	93.5	103.4	107.2	65.3
1909	80.5	16.6	5.1	51.0	141.7	128.3	91.1	85.1	91.0	86.0	37.2
1910	82.5	23.0	6.2	49.8	150.8	119.7	93.0	83.8	103.0	82.7	62.3
1911	81.5	18.5	5.8	50.5	144.1	126.5	89.1	86.2	91.7	96.0	55.9
1912	80.2	15.6	7.9	46.0	140.3	118.9	96.7	96.5	94.3	71.1	54.6
1913	77.4	19.0	7.5	41.3	140.0	114.2	89.6	90.3	84.3	77.5	38.9
1914	79.7	16.8	5.7	40.8	134.4	132.9	99.6	86.6	82.6	78.5	52.3
1915	84.8	14.4	6.4	47.0	145.6	140.8	89.5	100.5	98.4	85.7	51.3
Annual average, 1908–1915	81.0	17.6	6.6	47.0	143.1	125.0	92.1	90.4	93.5	85.3	52.1



PULMONARY TUBERCULOSIS

DIAGRAM SHOWING PER CENT INCREASE OR DECREASE IN AVERAGE ANNUAL DEATH RATES PER 100,000 POPULATION, BOTH SEXES, BY FIVE-YEAR AGE GROUPS, FOR THE YEARS 1898-1907, COMPARED WITH THE RATES FOR THE YEARS 1908-1914. BASED ON MICHIGAN.

OCCUPATIONAL DISTRIBUTION OF TUBERCULOSIS.

At the close of 1915, this department had on file 9,310 cases of tuberculosis, out of this number there were 2,917 persons who died of this disease during the year, leaving 6,393 living cases of tuberculosis in this state at the end of the year 1915.

As will be noticed by the following table, Housewives, Students, Laborers, Factory Employees, Clerks, Farmers and Machinists seem to be the occupations in which this disease prevails. Of the living cases, Housewives are 24%, Students 11%, Laborers 9%, Factory Employees 6%, Clerks 5%, Farmers 4%, and Machinists 4%. Of the persons who died during 1915, Housewives are 36%, Laborers 13%, Farmers 8%, Students 5%, Infants 5%, Clerks 4%.

Table showing the occupations of the living cases of tuberculosis in Michigan, as reported to this department, at the close of 1915, also the occupations of the persons who died of this disease during the year 1915.

Occupations.	Living cases.	Deaths.	Occupations.	Living cases.	Deaths.
Housewives	1,550	766	Firemen	16	7
Students	713	137	Sailors	15	6
Laborers	560	374	Blacksmiths	15	15
Factory	389	97	Stone Cutters	13	8
Clerks	326	116	Shoemakers	12	6
Farmers	268	229	Paper Mill Employees	11	5
Domestics	160	83	Chauffeurs	16	9
Infants	75	143	Musicians	9	4
Teachers	56	20	Physicians	9	4
Merchants	55	32	Ministers	8	6
Machinists	241	66	Druggists	8	5
Painters and paperhangers	96	36	Theatrical persons	8	6
Miners	85	31	Messengers	7	1
Agents	61	24	Mail Carriers	9	3
Carpenters	85	34	Chemists	6	1
Dressmakers	59	13	Fishermen	5	....
Teamsters	57	25	Candymakers	5	....
Inmates in prison or asylum	52	43	Dentists	4	3
Metal Workers	49	9	Glass Blowers	4	....
Stenographers	47	9	Jewelers	4	1
Railroad Men	46	28	Attendant in hospitals	4	1
Waiters	52	9	Contractors	4	4
Printers	46	18	Silk Workers	3	2
Saloon Men	47	25	Woodsmen	3	....
Moulders	39	16	Boilermakers	3	4
Telephone and telegraph operators	39	8	Veterinaries	3	1
Barbers	36	16	Cheesemakers	2	1
Mechanics	36	12	Woodworkers	2	....
Tailors	39	14	Lighthouse Keepers	2	1
Janitors	44	14	Elevator Men	2	....
Laundry Workers	29	2	Photographers	5	2
Masons	27	12	Undertakers	1	3
Electricians	26	17	Harnessmakers	1	1
Plumbers	30	8	Officials	1	1
Peddlers	30	5	Liverymen	1	....
Nurses	23	6	Life Savers	1	....
Bakers	22	4	Soldiers	1	4
Lumbermen	21	2	Buttermakers	....	1
Engineers	15	9	Not Stated	521	276
Butchers	18	13	Totals	6,393	2,917

TYPHOID FEVER, IN MICHIGAN, IN 1915 AND PRECEDING YEARS. GENERAL PREVALENCE.

In Table 7 is shown the general prevalence of typhoid fever, in Michigan, during each of the years, 1900 to 1915, and, as indicated by both the number of reported cases and the death rates per 100,000 population (preferably the latter indication), this disease was the least prevalent in the year 1915 than in any year shown in the table. As compared with the year 1914, when the death rate was lower than for any other preceding year, the rate for 1915 was 12 per cent lower than the rate for that year.

During the years, 1900 to 1907, there were reported to this department from all sections of the state 24,338 cases of typhoid fever, including 5,304 deaths, these deaths corresponding to an annual average death rate of 25.9 per 100,000 of the population. During the following eight years, 1908-1915, the number of reported cases amounted to 20,594, including 4,382 deaths, and which correspond to an annual average death rate of 19.0 per 100,000 population. Comparing these data for the two periods it will be noted that the number of reported cases decreased 3,744, the deaths 922 and the rate 6.9 deaths per each 100,000 population, in the last period of years over that of the former period. Employing the death rates as an indication of the prevalence of this disease, in the two eight year periods under discussion, it will be seen that typhoid fever has been reduced in this state 26.6 per cent in the eight year period ending with 1915 as compared with the eight years immediately preceding. This 26.6 per cent decrease as between the two periods represents 1,557 fewer deaths in the later period of years than would have occurred had the rate for the years 1900-1907 obtained during the years, 1908-1915.

That the saving of the 922 lives previously mentioned, as between the two periods under comparison, is due, mainly, to prevention, that is to the improvement of conditions affecting typhoid fever in this state, such as the improvement of certain water supplies, making more sanitary various localities, etc., which has been accomplished during the last eight years, is proven by the following explanation, applying to the state as a whole:

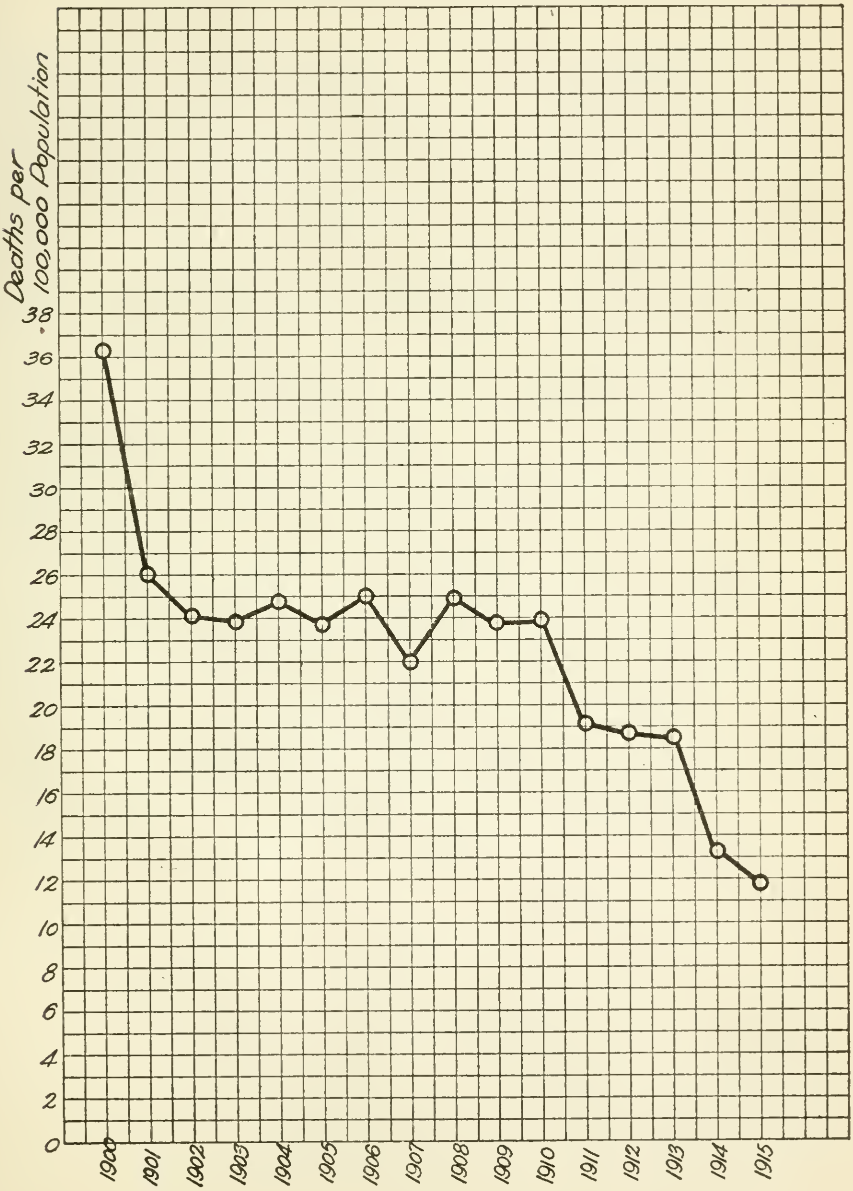
In the column captioned "Deaths per 100 cases," in Table 7, it will be noted that the fatality rate for the period, 1900-1907, was 21.8 deaths per each 100 cases reported, and that for the years, 1908-1915, the number of deaths per each 100 cases was 21.3, this difference as between the two fatality rates being equivalent to a reduction of 2.3 per cent in the fatality of the disease as between the two periods. Thus of the 922 fewer deaths as between the two periods, 2.3 per cent of the same, or 122, is attributable to the more efficacious treatment of the disease during the last eight years as compared with the former eight years, while 800, or 97.7 per cent of the 922 fewer deaths, is due to preventing a certain number of persons from contracting the disease, and thereby preventing deaths from the same. According to the fatality rate for the eight years ending with 1915, 21.3 persons out of every 100 sick with typhoid fever died from the disease. In other words, there were 4.7 persons sick with typhoid fever to every death recorded from that disease during the last eight years. Therefore, the number of persons who must have been prevented from having typhoid fever in order to prevent 800 deaths at the rate they were dying during the last eight years, would have been 800 x 4.7 or 3,760 cases, and, as previously mentioned, there occurred 3,744 fewer reported cases during the last eight years as compared with the former eight years. Thus, it will be noted that the comparatively improved sanitary conditions and the improved water supplies of the state, as between the two periods, not only saved the lives of 800 persons, but prevented 3,744 persons from contracting the disease.

While the error in the fatality rates, recorded in this table, lies in direct ratio of cases reported to the number in existence, and which no doubt causes these rates to be excessive, still there is no reason to believe that, for the state as a whole, the per cent of cases reported to the total in existence, during the two eight year periods under comparison, will vary enough to seriously impair the relation as between the percentage of reduction in deaths due to more efficacious treatment of the disease on the part of physicians and to the prevention of the disease on the part of this department.

TABLE 7.—*Showing the prevalence of typhoid fever, in Michigan, during the sixteen years, 1900–1915.*

Years.	Reported cases.	Deaths.	Deaths per 100 cases.	Deaths per 100,000 population.
1900	5,122	883	17.2	36.4
1901	3,002	644	21.5	26.1
1902	2,456	606	24.7	24.2
1903	2,840	603	21.2	23.7
1904	3,028	637	21.0	24.7
1905	2,774	618	22.3	23.6
1906	3,163	719	22.7	27.0
1907	1,953	594	30.4	22.0
Total, 1900–1907	24,338	5,304	21.8	25.9
1908	2,656	683	25.7	24.9
1909	2,694	657	24.4	23.6
1910	3,361	667	19.8	23.7
1911	2,660	547	20.6	19.1
1912	2,847	539	18.9	18.6
1913	2,253	539	23.9	18.4
1914	2,167	396	18.3	13.3
1915	1,956	354	18.1	11.7
Total, 1908–1915	20,594	4,382	21.3	19.0

DIAGRAM SHOWING THE PREVALENCE OF TYPHOID FEVER IN MICHIGAN DURING THE YEARS 1900-1915.



THE PREVALENCE OF TYPHOID FEVER IN MICHIGAN COMPARED WITH THAT OF THE OTHER STATES OF THE REGISTRATION AREA, AS CONSTITUTED IN 1900.

In the following table are shown the deaths and annual average death rates per 100,000 population from typhoid fever for two eight year periods, 1900-1907 and 1908-1915, in each of the ten states constituting the Registration Area of the United States in 1900, for comparison.

It will be noted by reference to this table that, of the ten states shown, only two—Indiana and Maine—experienced higher annual average death rates for the period, 1900-1907, than did Michigan. During the period, 1908-1915, Indiana was the only state having a higher annual average death rate than Michigan. It will also be noted that the percentage of reduction as between the death rates, for the two periods under comparison, was less in Michigan than for any of the other states with which comparisons are being made.

TYPHOID FEVER IN STATES OF REGISTRATION AREA.

State.	1900–1907.		1908–1915.		Per cent decrease in rates between 1900 to 1907 and 1908 to 1915.
	Deaths.	Rate.	Deaths.	Rate.	
Indiana	8,806	42.6	5,778	26.4	38.0
Maine	1,490	26.2	963	16.0	38.9
Michigan	5,304	25.9	4,382	19.0	26.6
Vermont	663	23.8	372	13.0	45.4
Connecticut	1,795	22.8	1,186	12.9	43.4
New York	13,917	21.9	9,605	12.7	42.0
New Hampshire	636	19.0	408	11.8	37.9
New Jersey	3,153	18.6	2,304	10.9	41.4
Rhode Island	686	18.2	558	12.4	31.9
Massachusetts	4,168	17.3	2,712	9.7	43.9
Total	40,618	24.0	28,268	14.5	39.6

DISTRIBUTION OF TYPHOID FEVER BY GEOGRAPHICAL SECTIONS OF THE STATE.

While, as previously stated the death rate from typhoid fever, in 1915, for the State as a whole, was very low compared with former years, and which was also true for some of the counties of the State, still there were a number of the counties that showed excessive death rates in 1915 compared with the rate for the State for that year.

Considered by Sections, the death rate registered in the Upper Peninsula for 1915 was 8.4 per 100,000 population, this being the lowest rate registered for any of the sections of the State. Although the rate for this section was very low, there were counties constituting the same that had unusually high rates in 1915, these counties being, together with their rates: Alger, 23.2; Luce, 24.4 and Mackinac, 29.7. Four of the counties of this Section did not experience mortality from typhoid fever in 1915.

The death rate for the Northern Section of counties for 1915 was 11.6, and the counties of this Section having excessive rates during that year were: Alcona, 35.0; Alpena, 44.7; Crawford, 25.0; Missaukee, 36.7; Montmorency, 25.3 and Otsego, 33.4. Ten of the counties of this Section had no deaths from typhoid fever in 1915.

The death rate for the Central Section of the State (13.0) was the highest recorded in any of the Sections for 1915. The various counties constituting this section contributed to this excessive rate as all experienced mortality from this disease in 1915, as only two counties of this section, Bay and Saginaw, showed an excessive number of deaths.

The Southern Section of counties experienced mortality from this disease corresponding to a death rate of 12.0 per 100,000 population in 1915. The only county having an excessive rate in this Section was Kalamazoo with a death rate of 24.4, and all the counties of this Section experienced deaths from typhoid fever except St. Joseph.

The death rates for each of the Sections and for nearly all the counties constituting the same show substantial decreases in 1915 as compared with their average death rates for the years, 1898-1914.

TABLE 7A.—*Showing the cases, deaths and death rates per 100,000 population from typhoid fever, in Michigan and in each of the counties of the State for 1915, also the averages for the years, 1898–1914, inclusive.*

State and counties by geographical sections.	1915.			Average, 1898–1914.		
	Cases.	Deaths.	Deaths per 100,000 population.	Cases.	Deaths.	Deaths per 100,000 population.
STATE OF MICHIGAN	**1,956**	**354**	**11.7**	**2,894**	**612.8**	**22.3**
I.—Upper Peninsula	**123**	**31**	**8.4**	**311**	**75.6**	**26.0**
Alger	4	2	23.2	6	2	29.9
Baraga	0	0	....	4	.6	10.5
Chippewa	8	1	3.8	50	9	39.3
Delta	15	4	12.2	45	16	57.2
Dickinson	2	0	....	9	2	9.5
Gogebic	8	3	10.6	13	5	27.8
Houghton	19	6	5.8	42	12	16.0
Iron	5	1	4.9	9	2	17.8
Keweenaw	0	0	....	1	.1	2.2
Luce	2	1	24.4	4	2	48.0
Mackinac	10	3	29.7	4	.9	10.4
Marquette	33	7	13.4	61	12	28.6
Menominee	3	2	8.0	42	9	34.0
Ontonagon	13	1	10.1	18	2	26.7
Schoolcraft	1	0	....	3	1	12.2
II.—Northern Counties	**218**	**37**	**11.6**	**382**	**74.2**	**23.0**
Alcona	3	2	35.0	4	.6	10.4
Alpena	92	9	44.7	28	7	35.3
Antrim	2	1	6.4	20	5	33.0
Arenac	0	0	....	4	.8	8.4
Benzie	7	0	....	26	2	19.5
Charlevoix	7	3	13.9	16	4	22.6
Cheboygan	1	1	5.4	13	2	12.8
Clare	3	0	....	8	1	15.4
Crawford	6	1	25.0	7	.7	18.7
Emmet	4	1	5.2	21	4	23.9
Gladwin	6	1	12.1	10	1	14.8
Grand Traverse	9	2	8.2	46	7	28.5
Iosco	12	0	....	5	2	18.1
Kalkaska	13	0	....	11	3	36.5
Lake	0	0	....	6	1	18.8
Leelanau	1	0	....	4	1	13.6
Manistee	14	5	19.1	29	6	23.5
Mason	8	1	4.2	19	5	22.8
Missaukee	5	4	36.7	15	2	22.2
Montmorency	5	1	25.3	3	.8	22.7
Ogemaw	3	1	11.5	9	2	21.6
Osceola	4	0	....	18	4	22.1
Oscoda	0	0	....	3	.06	3.0
Otsego	2	2	33.4	14	3	50.8
Presque Isle	2	1	8.6	13	2	22.4
Roscommon	0	0	....	1	.2	9.4
Wexford	9	1	4.5	29	7	34.5
III.—Central Counties	**340**	**60**	**13.0**	**428**	**99**	**21.8**
Bay	63	15	20.8	50	20	29.9
Gratiot	11	2	7.3	41	7	24.1
Huron	9	3	8.7	24	5	15.4
Isabella	12	3	13.6	30	5	20.0
Mecosta	6	3	15.9	19	5	24.3
Midland	20	2	14.8	24	5	31.9
Montcalm	13	1	3.2	23	7	20.8
Muskegon	19	6	13.9	26	8	20.1
Newaygo	2	1	5.0	18	5	25.2
Oceana	4	1	5.3	18	4	19.6
Saginaw	154	19	20.6	89	15	21.5
Sanilac	22	3	9.0	35	7	20.9
Tuscola	5	1	2.9	31	6	18.0

TABLE 7A.—*Concluded.*

Counties by geographical sections.	1915.			Average, 1898–1914.		
	Cases.	Deaths.	Deaths per 100,000 population.	Cases.	Deaths.	Deaths per 100,000 population.
IV.—Southern Counties	**1,275**	**226**	**12.0**	**1,773**	**364**	**23.3**
Allegan	11	2	4.9	26	6	14.1
Barry	12	2	8.6	18	3	12.6
Berrien	35	7	12.2	47	10	20.1
Branch	6	1	4.0	18	4	14.8
Calhoun	17	5	8.4	68	12	22.4
Cass	3	1	4.7	33	4	18.8
Clinton	7	1	4.7	33	5	21.9
Eaton	10	2	6.6	50	7	24.2
Genesee	123	6	7.2	72	14	27.8
Hillsdale	11	5	16.9	28	5	18.4
Ingham	22	3	4.9	98	15	31.1
Ionia	10	2	6.1	32	7	20.5
Jackson	22	1	1.7	83	12	23.6
Kalamazoo	22	3	4.3	74	10	18.8
Kent	212	43	24.4	2[illegible]8	45	30.4
Lapeer	14	3	11.9	28	5	19.8
Lenawee	17	5	10.7	48	11	21.9
Livingston	18	1	5.9	26	5	24.7
Macomb	12	5	15.5	38	9	26.3
Monroe	51	5	15.2	35	7	21.7
Oakland	22	2	3.8	37	9	20.0
Ottawa	19	6	12.5	28	8	18.0
St. Clair	29	9	18.1	109	20	37.1
St. Joseph	3	0	....	15	3	11.4
Shiawassee	21	5	15.2	28	6	17.5
Van Buren	11	4	12.6	58	9	26.5
Washtenaw	20	4	9.3	32	7	15.6
Wayne	515	93	14.3	313	106	23.9

DISTRIBUTION OF TYPHOID FEVER IN CITIES OF MICHIGAN HAVING 10,000 OR MORE INHABITANTS.

The reported cases, the deaths and death rates per 100,000 population from typhoid fever in cities having 10,000 or more inhabitants, during 1915 and preceding years, are shown in Table 8.

It will be noted by the figures in this table that the death rate in 1915, for all these cities combined, was lower than for any other year shown in the table, the rate for that year (16.4) being 29.6 per cent lower than the average annual rate for the years, 1910-1915, and 7.9 per cent lower than the rate for 1914, the rate for the latter year being the next lowest than for any year since 1904.

During the six years, 1904-1909, there were reported from all these cities combined 6,210 cases, including 1,666 deaths, from typhoid fever, these deaths corresponding to an annual average death rate of 29.8 per 100,000 population. During the following six years, 1910-1915, 8,406 cases, including 1,562 deaths, of typhoid fever were reported from these cities, the deaths corresponding to an annual average rate of 23.3 per 100,000 population. As between the periods, the number of reported cases increased 2,196, the deaths decreased 104 in number, and the death rates decreased 21.8 per cent in the last six years as compared with the six years, 1904-1909. This increase in the number of reported cases cannot be taken as an indication that the disease showed an increased prevalence in these cities during the last period as compared with the former, but indicates a better reporting of the number of recognized cases. As all deaths must be recorded, as provided by law, the death rate is the medium by which is measured the prevalence of typhoid fever in one locality as compared with another or as between years, thus, as previously stated, this decrease, in these cities during the last six years ending with 1915, decreased 21.8 per cent over the former six years.

As between the two six year periods, 1904-1909 and 1910-1915, of the twenty-three cities shown in the table, seven showed increases in their death rates, while the balance, or 16, showed decreases.

The seven cities showed increases in their death rates as between the two periods, are, together with the per cent of increase in the rates: Alpena, 52.1; Ann Arbor, 6.8; Flint, 8.5; Marquette, 34.3; Muskegon, 1.9; Pontiac, 63.9 and Port Huron, 54.9.

The cities showing decreases in their death rates as between the two periods under comparison, are, together with the per cent of decrease in their rates: Adrian, 35.4; Battle Creek, 31.2; Bay City, 12.3; Detroit, 6.0; Escanaba, 80.8; Grand Rapids, 26.6; Ironwood, 67.8; Ishpeming, 6.9; Jackson, 36.9; Kalamazoo, 40.5; Lansing, 52.9; Manistee, 35.2; Menominee, 46.8; Saginaw, 6.1; Sault Ste. Marie, 51.4 and Traverse City, 64.5.

As sewage polluted water supplies of many of Michigan's largest cities has been the source of numerous and serious epidemics of typhoid fever, due to the dejecta of persons ill with typhoid fever entering the sewers without having been properly disinfected, it becomes self-evident that something should be done to safeguard the quality of these waters. That this can be accomplished, promptly and efficiently, by treatment or filtration is borne out by the typhoid fever history of seven cities of Michigan, deriving their water from surface sources, and which are at present either treating or filtering their water supplies.

The following table, pertaining to those cities in which their public water supplies are receiving treatment, shows the annual average death rates from typhoid fever for the years, since 1904, or before the treatment of their water supplies, and their annual average death rates for the years, up to 1915, or since the treatment of their water supplies. The annual average death rate for the years before the treatment of the water began, for the seven cities combined, was 27.6 deaths per each 100,000 of the population, while the annual average rate recorded for the years since the treatment of the water was 18.0. The difference between these two rates represents a decrease in the prevalence of typhoid fever of 34.8 per cent as between the two periods of before and after the treatment of their water supplies. Some of the seven cities experienced even better results than the average for these cities combined. For instance, in Escanaba, where the water supply has been filtered since the year 1909, the death rate from typhoid fever for the years, 1904-1909, or before the filtration of their water supply, was 201.8 deaths per 100,000 population, while the death rate for the years, 1910-1915, or the years since filtration began, the death rate has dropped to 38.8 deaths, or which is equivalent to a reduction as between the years of non-filtration of their water supply and the years since such filtration of 80.8 per cent. In Traverse City, during the years of from 1904-1912, or before the hypochlorite treatment of their water, the annual average death rate from typhoid fever was 40.2; during the years, 1913-1915, or since the treatment of their water, the annual average death rate registered in that city was only 7.5 deaths per 100,000 population. This means a reduction of 81.3 per cent in the prevalence of typhoid fever in that city due solely to the purification of its water supply. So what has been accomplished in the seven cities mentioned, and especially in the two latter named cities, in the reduction of typhoid fever through the medium of pure water, can be done in any locality having an impure water supply.

TABLE 8.—*Showing the reported cases, the deaths and death rates per 100,000 population from typhoid fever, in each of the cities of Michigan having 10,000 or more inhabitants, during each of the years, 1904–1915.*

Cities.		1904.	1905.	1906.	1907.	1908.	1909.	Total cases and deaths and annual average death rate, 1904–1909.	1910.	1911.	1912.	1913.	1914.	1915.	Total cases and deaths and annual average death rate, 1910–1915.	Per cent increase (+) or decrease (−) in the death rate between 1904 to 1909 and 1910 to 1915.
TOTAL CITIES	Cases	1,383	1,061	1,136	797	885	948	6,210	1,782	1,388	1,707	1,112	1,238	1,179	8,406	
	Deaths	288	249	286	281	282	280	1,666	326	247	299	287	207	196	1,562	
	Death rates	33.7	28.1	31.2	29.7	28.8	27.8	29.8	31.4	23.1	27.2	25.4	17.8	16.4	23.3	−21.8
Adrian	Cases	1	0	6	4	7	16	34	2	3	1	2	2	2	12	
	Deaths	1	0	5	4	2	4	16	2	3	0	2	2	2	11	
	Death rates	9.9	......	46.7	37.3	18.6	37.2	25.7	18.6	27.8	......	18.0	17.8	17.6	16.6	−35.4
Alpena	Cases	11	6	10	3	10	23	62	7	17	8	88	147	92	359	
	Deaths	3	4	7	3	9	8	34	5	12	7	12	9	9	54	
	Death rates	24.6	32.6	56.0	23.9	71.4	63.2	45.7	39.3	94.0	54.2	92.3	68.8	68.3	69.5	+52.1
Ann Arbor	Cases	8	8	12	12	8	9	57	13	11	5	6	6	9	50	
	Deaths	2	2	3	1	2	3	13	5	3	2	0	2	2	14	
	Death rates	13.7	13.7	20.4	6.8	13.6	20.3	14.7	33.7	20.2	13.4	......	13.4	13.4	15.7	+6.8
Battle Creek	Cases	22	73	58	24	42	40	259	33	8	45	27	6	8	127	
	Deaths	5	9	8	6	10	9	47	8	4	6	12	3	5	38	
	Death rates	22.5	39.5	34.3	25.2	41.1	36.2	34.0	31.5	15.4	22.4	43.7	10.7	17.4	23.4	−31.2
Bay City	Cases	19	12	26	18	22	17	114	28	170	45	9	31	50	333	
	Deaths	19	10	20	17	20	16	102	11	19	32	7	16	10	95	
	Death rates	44.6	24.1	47.3	39.5	45.7	35.9	38.9	24.3	41.2	69.3	15.0	34.0	21.1	34.1	−12.3
Detroit	Cases	65	70	95	109	148	95	582	634	421	420	475	507	435	2,892	
	Deaths	56	69	79	104	84	92	484	108	78	88	153	76	75	578	
	Death rates	17.6	20.3	20.7	25.5	19.6	20.5	19.9	23.0	15.8	17.5	29.4	14.1	13.5	18.7	−6.0
Escanaba	Cases	204	21	14	32	27	44	342	8	10	5	9	1	11	44	
	Deaths	39	21	12	27	16	30	145	8	6	5	9	1	4	33	
	Death rates	351.4	182.9	101.4	221.4	127.4	232.2	201.8	60.3	44.0	35.7	62.6	6.8	26.5	38.8	−80.8

Flint	Cases	15	8	6	18	16	164	227	206	63	65	45	86	114	579	
	Deaths	3	3	6	7	11	21	51	40	8	11	7	13	5	84	
	Death rates	20.2	15.6	25.8	25.6	35.1	59.4	28.3	101.6	18.4	24.8	14.9	26.2	9.6	30.7	+8.5
Grand Rapids	Cases	659	518	352	193	193	229	2,144	238	222	344	150	170	195	1,319	
	Deaths	59	48	39	33	33	19	231	32	31	40	22	34	35	194	
	Death rates	61.6	48.6	38.4	31.6	30.7	17.2	36.9	28.3	26.7	33.9	18.2	27.6	27.8	27.1	−26.6
Ironwood	Cases	15	6	4	5	5	9	44	3	2	1	2	11	6	25	
	Deaths	4	6	4	4	5	9	32	2	1	0	1	5	3	12	
	Death rates	39.9	57.0	36.3	34.8	41.8	72.3	45.3	15.5	7.5	......	7.2	35.3	20.7	14.6	−67.8
Ishpeming	Cases	6	7	2	17	5	2	39	5	7	2	17	3	7	41	
	Deaths	0	1	2	6	0	1	10	2	1	0	3	1	2	9	
	Death rates	......	8.5	16.8	49.8	......	8.1	13.1	16.0	7.9	......	24.6	8.3	16.1	12.2	−6.9
Jackson	Cases	61	88	115	45	53	60	422	60	71	55	13	55	14	268	
	Deaths	12	16	6	7	5	6	52	10	9	6	4	7	1	37	
	Death rates	47.4	60.5	21.8	24.5	16.9	19.6	29.5	31.6	27.5	18.3	12.0	20.5	2.9	18.6	−36.9
Kalamazoo	Cases	74	65	73	68	61	26	367	101	44	47	25	15	22	254	
	Deaths	6	6	14	6	13	3	48	13	4	10	4	2	3	36	
	Death rates	20.1	19.0	42.2	17.2	35.6	7.9	23.2	32.7	9.7	23.4	9.0	4.4	6.3	13.8	−40.5
Lansing	Cases	27	13	79	31	55	61	266	115	57	78	40	32	14	336	
	Deaths	9	9	17	4	14	4	57	15	5	7	1	7	1	36	
	Death rates	44.4	40.4	70.4	15.4	50.2	13.4	36.1	47.4	14.9	20.3	2.8	18.7	2.6	17.0	−52.9
Manistee	Cases	14	10	18	15	22	12	91	19	10	5	12	5	11	62	
	Deaths	5	1	1	6	5	4	22	2	1	0	5	1	4	13	
	Death rates	37.0	7.5	7.9	47.9	40.1	32.2	28.1	16.2	8.1	......	42.5	8.6	32.3	18.2	−35.2
Marquette	Cases	16	17	23	18	17	7	98	34	17	127	19	13	19	229	
	Deaths	4	4	4	8	5	6	31	11	11	13	4	2	4	45	
	Death rates	37.5	37.0	36.5	72.1	44.5	52.7	46.9	95.3	94.2	109.9	23.4	16.5	32.6	63.0	+34.3
Menominee	Cases	15	6	10	15	6	9	61	23	22	6	3	10	3	67	
	Deaths	13	5	8	9	6	6	47	7	7	2	1	3	2	22	
	Death rates	117.2	45.5	73.5	83.4	56.1	56.7	69.3	66.7	67.4	20.0	10.3	31.5	19.0	36.9	−46.8
Muskegon	Cases	23	30	18	14	19	19	123	28	20	6	9	9	16	88	
	Deaths	6	6	7	3	7	0	29	6	5	3	9	4	5	32	
	Death rates	28.7	27.9	31.8	13.3	30.3	......	21.0	24.8	20.2	12.1	35.8	15.7	19.4	21.4	+1.9
Pontiac	Cases	2	4	4	3	4	10	27	59	50	40	14	7	4	174	
	Deaths	2	3	3	3	1	2	14	8	7	8	2	1	2	28	
	Death rates	18.4	25.1	24.0	23.0	7.4	14.2	18.0	54.6	46.1	51.1	12.4	6.0	11.7	29.5	+63.9
Port Huron	Cases	15	10	26	54	11	13	129	64	44	242	10	25	10	395	
	Deaths	7	3	11	9	4	11	45	14	9	37	5	0	4	69	
	Death rates	34.9	15.1	56.1	46.3	20.8	57.8	39.5	74.4	48.3	196.8	26.6	......	21.2	61.2	+54.9

TABLE NO. 8.—*Concluded.*

Cities.		1904.	1905.	1906.	1907.	1908.	1909.	Total cases and deaths and annual average death rate, 1904–1909.	1910.	1911.	1912.	1913.	1914.	1915.	Total cases and deaths and annual average death rate, 1910–1915.	Per cent increase (+) or decrease (−) in the death rate between 1904 to 1909 and 1910 to 1915.
Saginaw	Cases	67	32	40	42	74	34	289	38	65	121	102	83	125	534	
	Deaths	23	12	12	9	14	15	85	11	12	16	18	14	17	88	
	Death rates	49.3	25.4	25.0	18.5	28.4	30.0	29.6	21.7	23.4	30.6	33.9	25.9	31.0	27.8	−6.1
Sault Ste. Marie	Cases	16	21	7	28	33	23	128	30	27	12	25	14	7	115	
	Deaths	6	8	7	2	9	7	39	3	7	3	3	4	1	21	
	Death rates	52.4	68.6	59.0	16.6	73.4	56.2	54.5	23.7	54.5	22.9	22.6	29.6	7.3	26.5	−51.4
Traverse City	Cases	28	36	138	30	47	26	305	34	27	27	10	0	5	103	
	Deaths	4	3	11	3	7	4	32	3	4	3	3	0	0	13	
	Death rates	35.6	26.3	95.3	25.6	59.1	33.3	47.6	24.7	32.5	23.6	23.1	......	......	16.9	−64.5

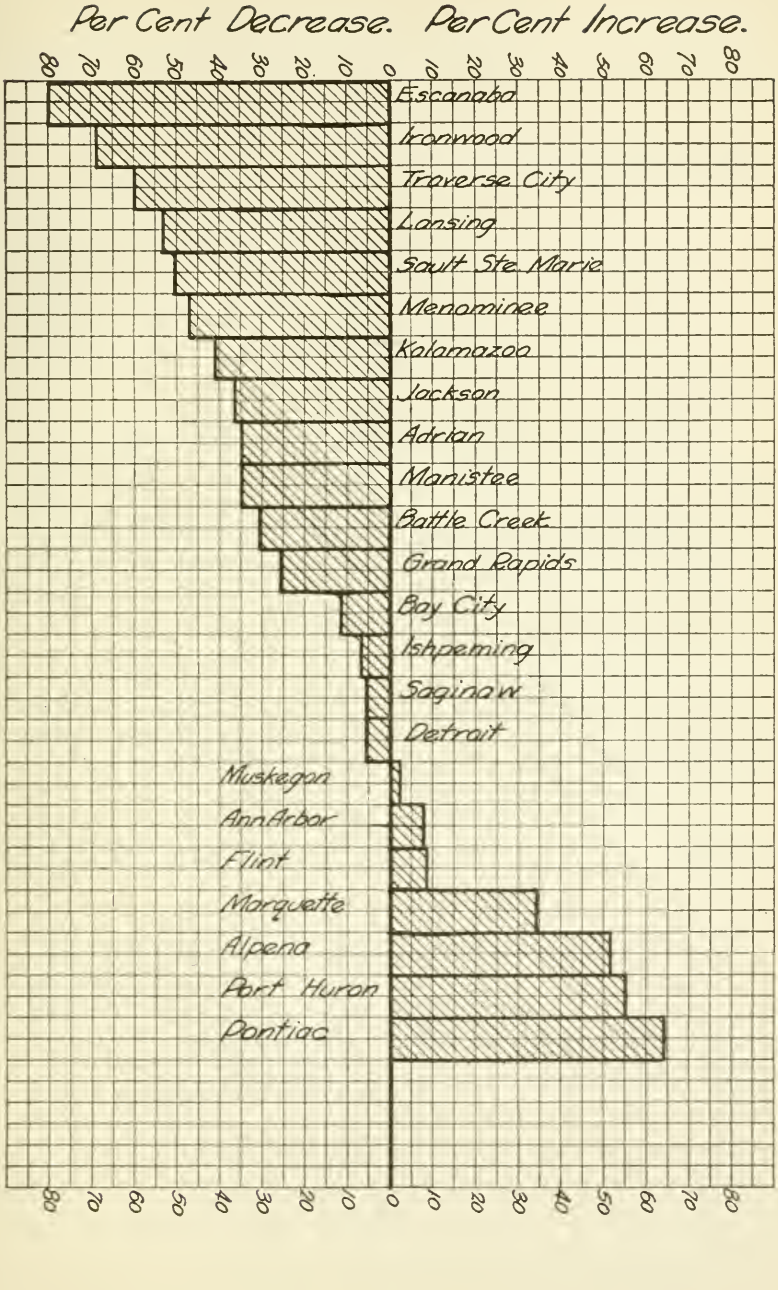


DIAGRAM - SHOWING THE PER CENT INCREASE AND DECREASE IN THE ANNUAL AVERAGE DEATH RATE FROM TYPHOID FEVER IN CITIES OF MICHIGAN OF 10000 POPULATION AND OVER, AS BETWEEN THE TWO SIX YEAR PERIODS 1904-1909 AND 1910-1915.

Table showing the deaths and the annual average death rates per 100,000 population from typhoid fever, during the years following 1903 when their public water supplies were neither filtered or treated; and the same for the years up to and including 1915, during which time their public water supplies had either been filtered with hypochlorite or liquid chlorine, in certain cities whose water supplies are obtained from surface sources.

Cities.	Before treatment.			After treatment.			Per cent decrease in the death rate between the years of before and after treatment of water.
	Years. (inclusive.)	Deaths.	Annual average rate.	Years. (inclusive.)	Deaths.	Annual average rate.	
Ann Arbor	1904–1911	21	17.8	1912–1915	6	10.0	43.8
Battle Creek	1904–1911	59	31.1	1912–1915	26	23.4	24.8
Detroit	1904–1913	911	20.6	1914–1915	151	13.7	33.5
Escanaba*	1904–1909	145	201.8	1910–1915	33	38.8	80.8
Flint*	1904–1912	110	36.0	1913–1915	25	16.9	53.1
Grand Rapids*	1904–1912	334	34.4	1913–1915	91	24.6	28.5
Menominee	1904–1909	47	69.3	1910–1915	22	36.9	46.8
Port Huron	1904–1912	105	61.7	1913–1915	9	16.0	74.1
Traverse City	1904–1912	42	40.2	1913–1915	3	7.5	81.3
Total for these cities	....	1,774	27.6	....	366	18.0	34.8

*Filtration plants in use in these cities.

To further emphasize the fact that an impure water supply made pure will not only reduce the prevalence of typhoid fever in those localities, but the reduction in the death rate will be much greater than in those localities having questionable or impure surface water supplies, and in which no attempt has been made to purify the same (any reduction in the death rates in these latter localities being due to the improvement of other conditions affecting typhoid fever), the following table has been prepared for this comparison:

In this table is shown the cities whose water supplies are derived from surface sources, but which, up to 1915, have remained untreated, and while the periods under comparison differ from those cities where the water supplies were treated, still the comparison of the percentage of reduction in the death rates, as between those cities whose water supplies have been treated and those which have not, is not vitiated. It will be noted by this table that the annual average death rate for those cities combined having untreated water supplies for the years, 1904-1909, was 33.3 per 100,000 population; while for the years, 1910-1915, the death rate was 28.0. The difference as between these two rates represents a decrease of only 15.9 per cent in the prevalence of typhoid fever, while, as previously stated, the death rate in those cities having treated water supplies decreased 34.8 per cent as between the years of before and after treatment of the same.

Alpena, where the water supply has been treated since 1912, but not successfully so, has been excluded from these calculations owing to this fact.

Table showing the deaths and the combined death rates from typhoid fever for the periods, 1904-1909 and 1910-1915, in cities whose water supplies were obtained from surface sources, but which were neither filtered or otherwise treated.

Cities.	Total deaths 1904–1909.	Total annual average rate, 1904–1909.	Total deaths 1910–1915.	Total annual average rate, 1910–1915.
Adrian	16	....	11	....
Bay City	102	....	95	....
Ironwood	32	....	12	....
Ishpeming	10	....	9	....
Marquette	31	....	45	....
Muskegon	29	....	32	....
Saginaw	85	....	88	....
Sault Ste. Marie	39	....	21	....
Total	344	33.3	313	28.0

The cities, in the aggregate, whose water supplies are obtained from wells, show not only lower death rates from typhoid fever, but a higher percentage of decrease in the rates as between the periods, 1904-1909 and 1910-1915, than do cities obtaining their water supplies from surface sources, under the same comparison. Of the cities shown in Table 9, Jackson, Kalamazoo, Lansing, Manistee and Pontiac, obtain their public water supplies from wells, while the balance of the cities obtain theirs from surface sources. The annual average death rate for those cities whose water supplies are obtained from wells for the years, 1904-1909, was 27.7, and for the following six years, 1910-1915, the rate was 17.9, the difference as between the rates for the two periods representing a decrease of 35.4 per cent in the prevalence of typhoid fever in all these cities combined. The average death rate for all the cities combined obtaining their water from surface sources was, for the first period, 30.1 per 100,000 population, and the average rate for the six years ending with 1915 was 24.1, or which is equivalent to decrease as between the rates for the two periods under comparison of 19.9 per cent.

As it is generally presumed that water obtained from deeply sunken wells is less liable to contamination than is water taken from surface sources, the above facts again serve to show the direct relation of water supplies to typhoid fever, and also again proves that the death rate from typhoid fever shows greater reductions in localities having pure water for the consumption of its population than in those localities where the water is impure or at least questionable.

Table 9 showing deaths and death rates per 100,000 population from typhoid fever, for the years 1904-1909 and 1910-1915, in certain cities whose water supplies are obtained from wells.

Cities.	1904–1909.		1910–1915.		Per cent increase (+) or decrease (−) in rate.
	Deaths.	Rate.	Deaths.	Rate.	
Jackson	52	29.5	37	18.6	−39.6
Kalamazoo	48	23.2	36	13.8	−40.5
Lansing	57	36.1	36	17.0	−52.9
Manistee	22	28.1	13	18.2	−35.2
Pontiac	14	18.0	28	29.5	+63.9
Total	193	27.7	150	17.9	−35.4

AGE AND SEX DISTRIBUTION OF THE CASES OF TYPHOID FEVER, IN MICHIGAN, REPORTED DURING THE THREE YEARS, 1913, 1914 AND 1915.

In Table 10 is shown the age and sex distribution of 6,382 cases of typhoid fever reported to this department during the three years, 1913, 1914 and 1915, as indicated by the per cent of cases among the sexes and at each age group to the total reported cases of both sexes and at all ages. This table also shows the attack frequency as indicated by the ratio of cases among those of each sex and all ages and at the various age groups to each 100,000 of population of corresponding sex and age.

Of the 6,382 cases reported during the three years mentioned, 3,679, or 57.6 per cent, were among males, and 2,703, or 42.4 per cent, were among females. Among both sexes, 65 per cent of the total cases were among persons aged from 5 to 30 years; and the single age group registering the highest per cent of cases was 20-24, the per cent being 16.1.

As the per cents simply show the distribution of the cases and take no account of the age distribution of the population, and therefore do not show the attack frequency, the figures in the last three columns of Table 10 should be employed in determining the comparative susceptibility to this disease as between the sexes at all ages and at various ages, and as between those of the various ages of the same sex.

It will be noted by this table that among both sexes combined and at all ages, the annual average death rate for the three years, 1913-1915, was 71.5 cases per 100,000 of the total population. Considered by sex, the males, at all ages, experienced a case rate of 79.5 per 100,000 of the male population, while the rate for the females was 62.8 per 100,000 population of that sex. In other words, for every 100 males, at all ages, who were attacked with typhoid fever, there were 79 females who contracted the disease. At the various age groups, the ratio of attack among females to each 100 attacks among the males, were: Under 5 years of age, 98.0; 5-9 years, 113.6; 10-14, 96.9; 15-19, 86.0; 20-24, 69.0; 25-29, 64.7; 30-34, 64.8; 35-39, 62.6; 40-44, 68.1; 45-49, 70.7; 50-54, 75.9; 55-59, 72.0, and 60 years of age and over, 79.0. At every age group, with the exception of the age group 5-9, the males showed a greater susceptibility to this disease than do females, and the susceptibility among females after the age group 5-9, decreases with the advancement of age up to the 40th year, after which age the possibility of being attacked with typhoid fever grows more equal as between the sexes.

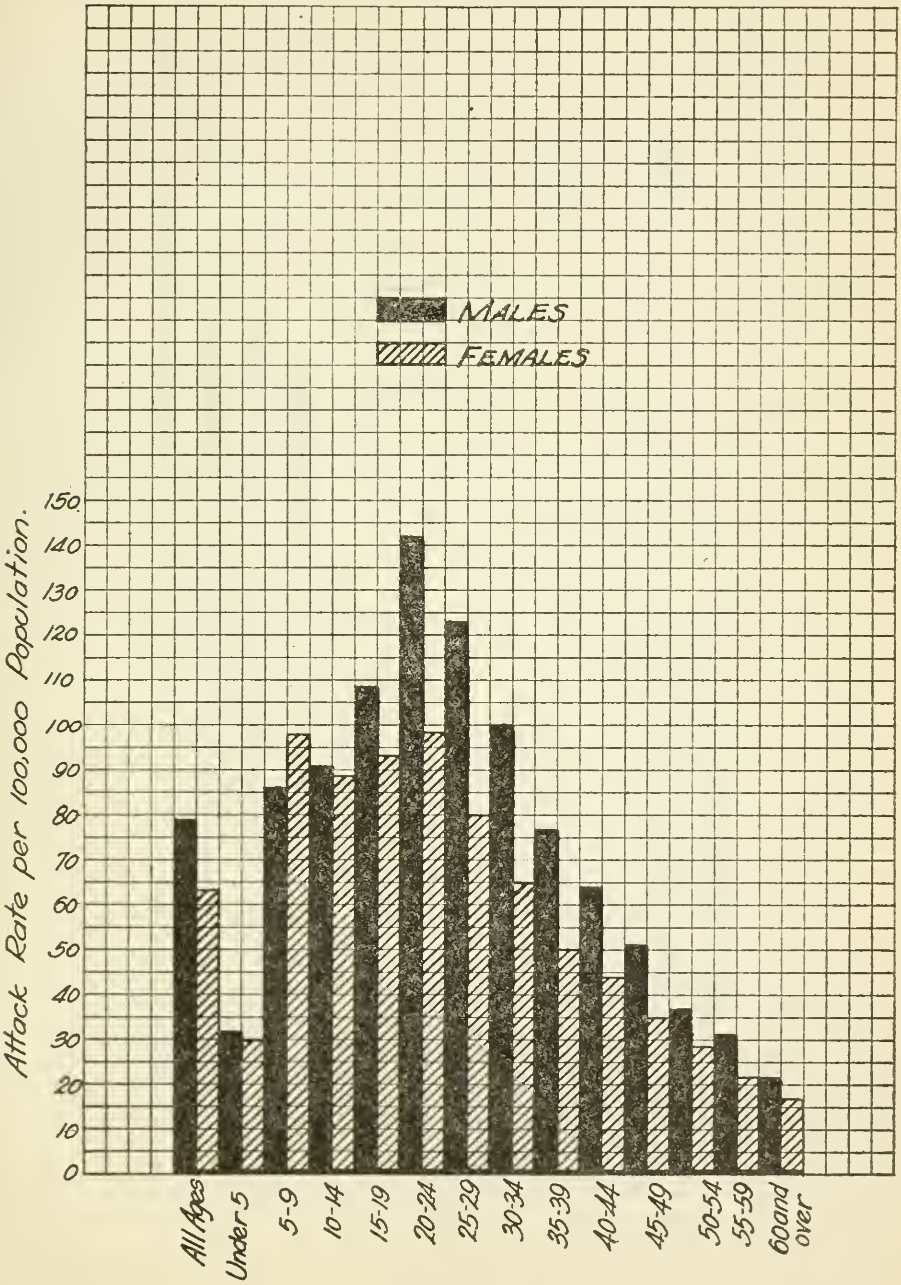
Comparing the attack rates at the various ages among those of the same sex, and it will be seen that the case rates are at the minimum among those of the very young and the very old. Among the males under 5 years of age, the attack rate was 30.5 per 100,000 of the male population of that age, the rate advancing steadily with the advancement of age after the fifth year of age up to the age group 20-24, when the maximum rate (142.1) is reached, after which age the rate declines quite rapidly and steadily with the advancement of age, the lowest rate being recorded at the oldest age group. The possibility of being attacked with typhoid fever among persons from 20-24 years, is 4.7 times greater than among those of the same sex under 5 years of age, and 7.2 times greater than among the males 60 years and over. Among the females, the maximum rate also occurs at the age group 20-24 and the minimum rates at the two extremes of life, with the chances of attack more favorable to those of old age.

While we have employed the word "susceptibility" in accounting for the wide difference in the case rates as between the sexes at all ages and at the various age groups and at the various age groups among those of the same sex, perhaps a better reason for these differences would be exposure to the disease. There is no question but that the male population is subjected to a greater degree of exposure to this disease than are the females at all ages, and that in middle life this exposure becomes greater than at the younger ages as between the sexes, and of the same sex, the degree of exposure to typhoid fever will vary with the ages.

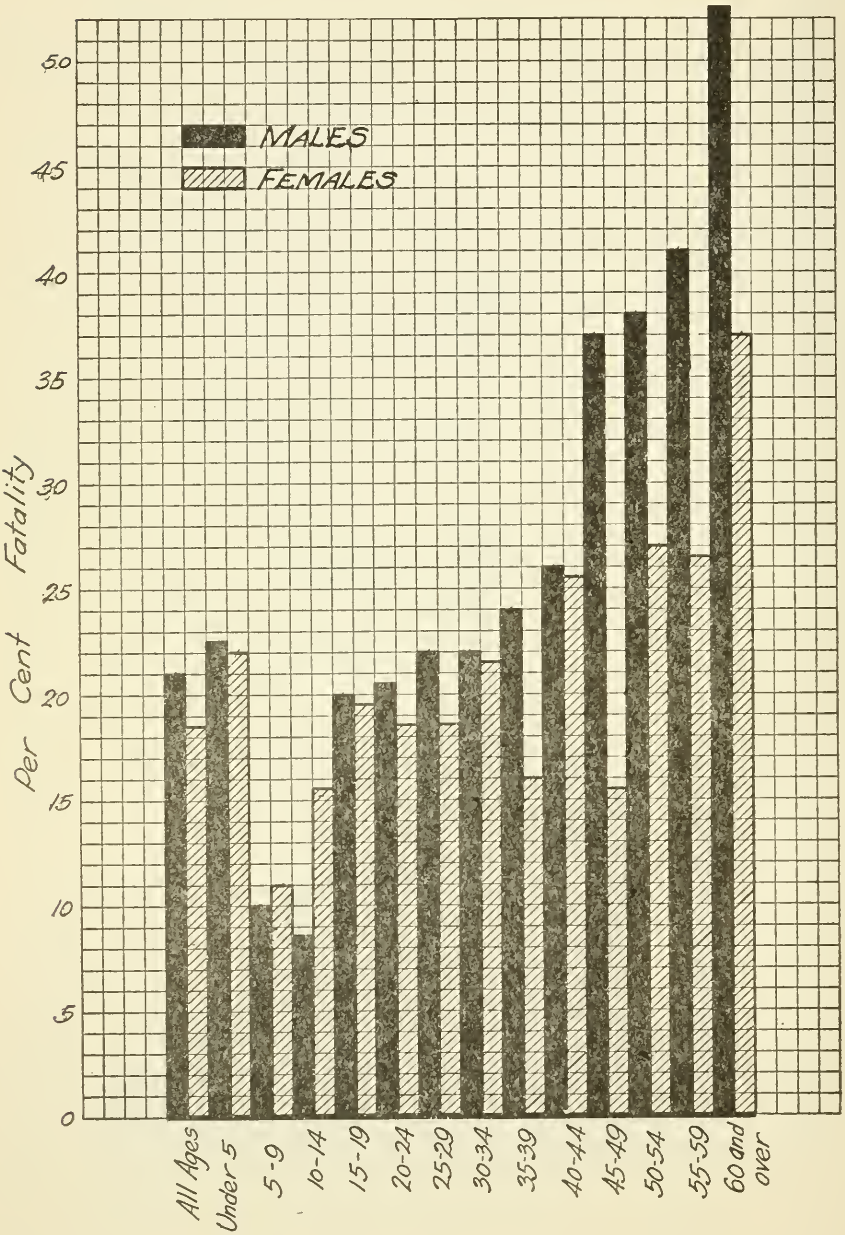
TABLE 10.—*Showing the age and sex distribution of cases of typhoid fever, as indicated by the ratio of cases among each sex at the various age groups to the total reported cases of both sexes and at all ages. Also showing the comparative susceptibility of each sex at the various ages to typhoid fever, as indicated by the annual case rate per 100,000 population of corresponding age and sex. These data are based on Michigan's statistics for the years 1913, 1914 and 1915, combined.*

Age groups.	Total cases.			Per cent of total cases.			Average annual case rate per 100,000 population of corresponding age and sex.		
	Both sexes.	Males.	Females.	Both sexes.	Males.	Females.	Both sexes.	Males.	Females.
ALL AGES	6,382	3,679	2,703	100.0	57.6	42.4	71.5	79.5	62.8
Under 5 years	285	146	139	4.5	2.3	2.2	30.2	30.5	29.9
5–9 years	774	367	407	12.1	5.7	6.4	92.1	86.3	98.0
10–14 years	710	365	345	11.1	5.7	5.4	89.9	91.3	88.5
15–19 years	852	467	385	13.3	7.3	6.0	101.0	108.4	93.2
20–24 years	1,025	624	401	16.1	9.8	6.3	120.9	142.1	98.1
25–29 years	794	502	292	12.4	7.8	4.6	102.5	123.0	79.6
30–34 years	560	351	209	8.8	5.5	3.3	83.0	99.8	64.7
35–39 years	387	246	141	6.1	3.9	2.2	63.7	77.6	48.6
40–44 years	294	181	113	4.6	2.8	1.8	54.7	64.5	43.9
45–49 years	214	131	83	3.4	2.1	1.3	43.5	50.5	35.7
50–54 years	148	89	59	2.3	1.4	0.9	33.1	37.3	28.3
55–59 years	90	56	34	1.4	0.9	0.5	27.1	31.1	22.4
60 years and over	155	90	65	2.4	1.4	1.0	19.7	21.9	17.3
Not stated	94	64	30	1.5	1.0	0.5	....	....	....

TYPHOID FEVER - RELATIVE PROBILITY OF ATTACK, BY SEXES, AT ALL AGES AND AT SPECIFIC AGES



TYPHOID FEVER - PROBABILITY OF DYING, AFTER ATTACK, BY SEXES, AT ALL AGES, AND AT SPECIFIC AGES



RELATION OF AGE AND SEX TO CASE FATALITY IN TYPHOID FEVER, IN MICHIGAN, BASED ON THE STATISTICS FOR THREE YEARS, 1913, 1914 AND 1915, COMBINED.

In the preceding table was shown the comparative probability of being attacked with typhoid fever, as between the sexes at all ages and at the various ages also as between the ages of those of the same sex, and the study of the relation of age and sex to typhoid fever will be concluded by showing the comparative probability of dying from typhoid fever, after attack, as between the sexes at all ages and at the various ages and as between the various ages of those of the same sex. These data are contained in Table 10, and the same may well be studied in conjunction with the data in Table 11.

Of the 6,382 cases of typhoid fever reported to this Department during the three years, 1913-1915, 1,275, or 20.0 per cent, proved fatal. Among the males of the 3,679 cases reported, 771, or 21.0 per cent died, while of the 2,703 cases among females, 504, or 18.6 per cent, succumbed to the disease. Thus it will be noted that the males, at all ages, are not only more liable to contract typhoid fever, but are more liable to die from the disease after having been attacked, than are the females. It will also be noted that the case fatality, as well as the attack rate, shows wide variations at the various age groups. In general, the fatality rate is lowest for the age group 5-9, rising through the years of adolesence, and rises very slowly through the ages of maturity until the age of 45, when the rate takes a sharp turn upwards. Under 5 years of age the fatality rates as between the two sexes is practically the same, and at the ages of from 5 to 15 years of age the females show a greater probability of dying from this disease than do the males of the same ages, but at every other age group, except 30-34, the males show higher fatality rates than the females. At the ages of 60 years and over, the males stand less than an even chance of recovering from typhoid fever when once attacked, the chances of recovering at these ages, being 46.7 out of every 100 taken sick, and the chances of dying being 53.3.

The error in these statistics lie in the failure to recognize and report cases of typhoid fever, and the fatality rate is, therefore, in all probability too high. There is no reason, however, to suspect that the failure to report recognized cases affects any one sex or age group more than another, and while the ratio of cases as to deaths may be too low in general, the relation of the fatality rates, as between the sexes at all ages and at different ages, and as between the different ages of those of the same sex, is in all probability approximately correct. What has just been stated in connection with fatality rates will apply with equal force to the data pertaining to the relation of age and sex to the prevalence of typhoid fever.

TABLE 11.—*Showing relation of age and sex to case fatality in typhoid fever, as indicated by the per cent of deaths registered at each age group and each sex to the total number of reported cases taken sick at corresponding ages and sex. These datas are based on Michigan statistics and cover the years 1913, 1914 and 1915, combined.*

Age groups.	Total.			Males.			Females.		
	Cases.	Deaths.	Per cent.	Cases.	Deaths.	Per cent.	Cases.	Deaths.	Per cent.
ALL AGES	6,382	1,275	20.0	3,679	771	21.0	2,703	504	18.6
Under 5 years	285	64	22.5	146	33	22.6	139	31	22.3
5–9 years	774	85	11.0	367	36	9.8	407	49	12.0
10–14 years	710	85	12.0	365	31	8.5	345	54	15.7
15–19 years	852	169	19.8	467	94	20.1	385	75	19.5
20–24 years	1,025	203	19.8	624	129	20.7	401	74	18.5
25–29 years	794	164	20.7	502	110	21.9	292	54	18.5
30–34 years	560	124	22.1	351	77	21.9	209	47	22.5
35–39 years	387	83	21.4	246	59	24.0	141	24	17.0
40–44 years	294	76	25.9	181	47	26.0	113	29	25.7
45–49 years	214	62	29.0	131	49	37.4	83	13	15.7
50–54 years	148	50	33.8	89	34	38.2	59	16	27.1
55–59 years	90	32	35.6	56	23	41.1	34	9	26.5
60 years and upwards	155	72	46.5	90	48	53.3	65	24	36.9
Ages not stated	91	6	6.4	64	1	1.6	30	5	16.7

TYPHOID FEVER - THE RELATION OF AGE TO CASE FATALITY, AS INDICATED BY THE NUMBER OF PERSONS TAKEN SICK AND WHO DIED AT EACH AGE GROUP. 1913, 1914 AND 1915. SEE TABLE 13.

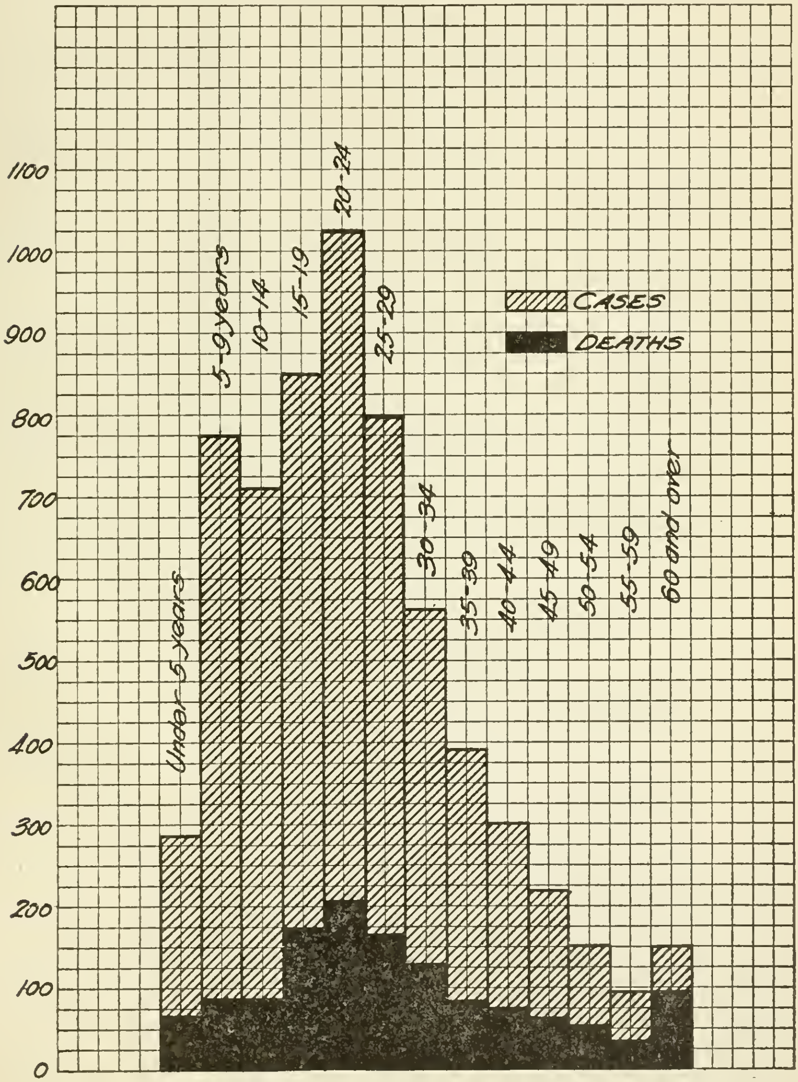
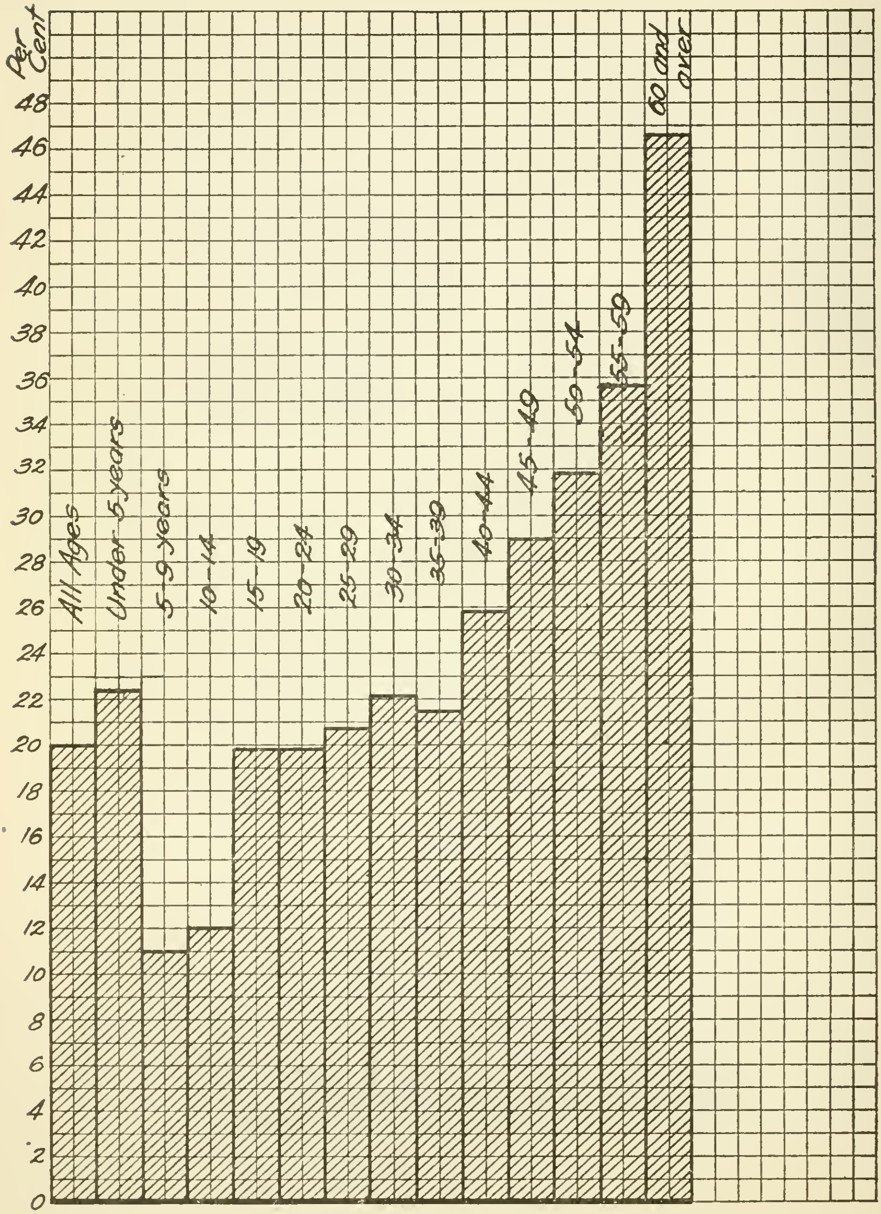


DIAGRAM SHOWING THE RELATION BETWEEN AGE AND CASE FATALITY FOR TYPHOID FEVER. 1913, 1914 AND 1915.



SEASONAL PREVALENCE OF TYPHOID FEVER, IN MICHIGAN, BASED ON THE STATISTICS FOR THE THREE YEARS, 1913, 1914 AND 1915, COMBINED.

In Table 12 is shown the distribution, by months, of the 6,382 cases of typhoid fever reported to this Department during the years 1913-1915.

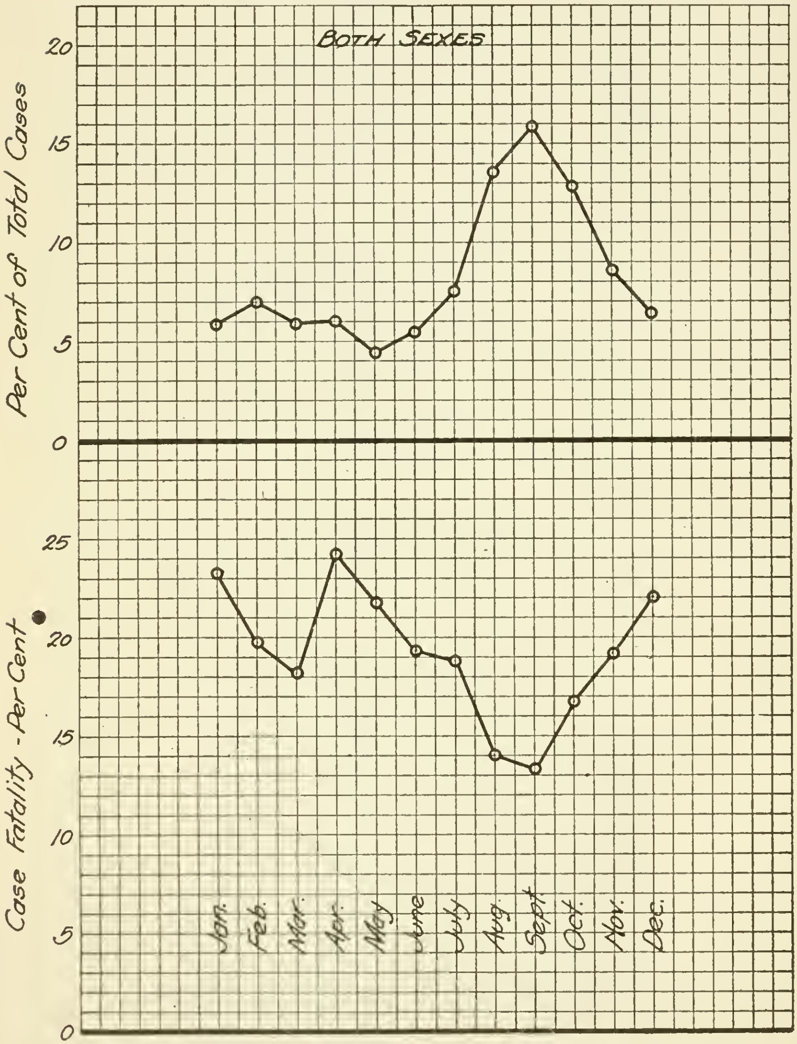
Believing that one sex might show a greater susceptibility to this disease than the other in certain months of the year, the data in this table are shown for both sexes combined and for each sex separately, but, as may be seen by reference to the above mentioned table, no such condition seems to exist.

Among both sexes combined, the months in which the greatest number were taken sick were August, September and October, 41 per cent of all persons taken sick during the three years mentioned having been taken sick in those three months. The least number of attacks were registered in the month of May. During the months of from January to July, inclusive, the number of attacks remains quite uniform, the number of attacks takes a sharp upward turn and reaches the maximum in September, after which month the number of attacks again gradually subside, so that by December the prevalence of the disease is practically the same as during the months of from January to July.

TABLE 12.—*Showing the relation of seasonal prevalence and sex to typhoid fever, as indicated by the ratio of cases taken sick in each month among each sex to the total reported cases of each sex. These data are based on Michigan's statistics and are for the years 1913, 1914 and 1915, combined.*

Month.	Total.		Males.		Females.	
	Cases.	Per cent.	Cases.	Per cent.	Cases.	Per cent.
TOTAL	6,382	100.0	3,679	100.0	2,703	100.0
January	366	5.7	199	5.4	167	6.2
February	432	6.8	237	6.4	195	7.2
March	362	5.7	187	5.1	175	6.5
April	372	5.8	206	5.6	166	6.1
May	300	4.7	177	4.8	122	4.5
June	336	5.3	198	5.4	138	5.1
July	475	7.4	290	7.9	185	6.8
August	845	13.2	480	13.0	365	13.5
September	990	15.5	563	15.3	427	15.8
October	798	12.5	476	12.9	322	11.9
November	536	8.4	302	8.2	234	8.7
December	395	6.2	259	7.0	136	5.0
Not stated	175	2.7	105	2.9	71	2.6

TYPHOID FEVER- RELATION OF SEASONS TO PEVALENCE, AS SHOWN BY PER CENT OF TOTAL CASES TAKEN SICK EACH MONTH. ALSO RELATION OF SEASONS TO FATALITY, AS INDICATED BY PER CENT FATALITY OF CASES IN EACH MONTH. MICHIGAN STATISTICS 1912-1915.



RELATIONS OF SEASONS OF THE YEAR TO CASE FATALITY IN TYPHOID FEVER, IN MICHIGAN, BASED ON THE STATISTICS FOR THE YEARS, 1913-1915, COMBINED.

As was shown in the preceding table, a person is more liable to contract typhoid fever during the months of August, September and October than during any of the other months of the year, but, on the other hand, as indicated by the data contained in Table 13, persons taken sick during these three months are less liable to die from the disease than are those taken sick in the other months of the year. It will be noted that the fatality rates for each month form practically an inverse ratio to the months of most frequent attacks. In other words, the months in which the greatest number of persons are taken sick are, approximately, the same months in which the least number, in proportion to the number taken sick, succumb to the disease. These conclusions are based on the per cent of cases terminating fatally to the total number of reported cases taken sick in the same months. As between the sexes, slight differences occur in the fatality rates throughout the year, March and May being the only two months in which the fatality rates of the females exceeds that of the males.

TABLE 13.—*Showing the relation of seasons and sex to the fatality from typhoid fever, as indicated by the per cent of cases which terminated fatally to the total reported cases taken sick in the same month for each sex. These data are based on Michigan's statistics for the years 1913, 1914 and 1915, combined.*

Month.	Total.			Males.			Females.		
	Cases.	Deaths.	Per cent.	Cases.	Deaths.	Per cent.	Cases.	Deaths.	Per cent.
TOTAL	6,328	1,275	20.0	3,679	771	21.0	2,703	504	18.6
January	366	85	23.2	199	48	24.1	167	37	22.2
February	432	86	19.9	237	49	20.7	195	37	19.0
March	362	66	18.2	187	32	17.1	175	34	19.4
April	372	90	24.2	206	51	24.2	166	39	23.5
May	300	65	21.7	177	38	21.5	122	27	22.1
June	336	65	19.3	198	43	21.7	138	22	16.0
July	475	90	18.9	290	56	19.3	185	34	18.4
August	845	119	14.1	480	68	14.2	365	51	14.0
September	990	133	13.4	563	87	15.5	427	46	10.8
October	798	134	16.8	476	88	18.5	322	46	14.3
November	536	103	19.2	302	62	20.5	234	41	17.5
December	395	87	22.0	259	55	21.2	136	32	23.5
Not stated	175	152	....	105	94	....	71	58	....

DIPHTHERIA IN MICHIGAN IN 1915 AND PRECEDING YEARS.

GENERAL PREVALENCE.

In Table 14 are shown the reported cases, the deaths and the death rates per 100,000 population, together with the case fatality rates, from diphtheria, in Michigan, during each of the years, 1900 to 1915, or during the years since the antitoxin treatment of the disease has become quite general.

During the year 1915, there were reported to this department 4,386 cases of diphtheria, of which number, 361, or 8.2 per cent, terminated fatally. The deaths correspond to an annual death rate of 12.0 per 100,000 population, which is the lowest rate recorded for any year shown in the table.

As indicated by the death rates per 100,000 population, shown in the table, it will be observed that an unusually large epidemic of diphtheria prevailed in 1903, the death rate for that year being 26.9. This epidemic gradually subsided, until in the year 1908, or five years later, the state was comparatively free of diphtheria. In 1909, the death rate again began to rise and continued to do so from year to year, until 1913, or just ten years after the epidemic previously referred to, the disease again assumed an epidemic form, but which was less fatal than in the former epidemic. While the decrease in the fatality of the disease, as between the two epidemic years, is probably due to some extent to the reporting of a larger proportion of the number of cases in actual existence, during the later year as compared with the earlier one, it is believed that a large share of the decreased fatality must be credited to the antitoxin treatment, as there is no question but that more physicians of the state were treating diphtheria patients with antitoxin in 1913 than there were in 1903. And while epidemics of this disease are bound to recur at certain intervals, usually every ten years, due to an accumulation of susceptible persons (children of ten years of age and under), and to certain conditions which appear to operate in determining the periodicity, but about which little is known, the fatality of the disease should decrease in a certain proportion with the more general use of antitoxin in treating this disease.

It is perhaps opportune to state here that the fatality of the disease, as indicated by the annual average case fatality rates for the two eight year periods, 1900-1907 and 1908-1915, shown in this table, was reduced 27 per cent as between these two periods of years; and by the same comparison, the death rate per 100,000 population from this disease, also shows considerable decrease, the same being 18.3 per cent.

In the following table are shown the number of households that were infected with diphtheria during each of the years 1910-1915, together with the cases occurring therein, and the number of cases per each 100 households:

Year.	Number of households.	Reported cases.	Cases per 100 households.
1910	2,703	3,433	127
1911	3,038	3,762	124
1912	2,665	3,294	124
1913	4,529	5,505	122
1914	4,342	5,149	119
1915	3,697	4,386	119

While the number of persons sick per 100 households decreased from 127, in 1910, to 119, in 1915, and which would indicate that either a larger proportion of exposed persons in a household were being prevented from contracting the disease through the medium of antitoxin, or that local health officers were more rigidly enforcing the preventive measure of isolation of the sick, or to both, in the later years as compared with earlier years, it is impossible to determine from the data at hand which of the two mediums of prevention should be given this credit.

TABLE 14.—*The prevalence of diphtheria and croup, in Michigan, during each of the sixteen years, 1900–1915.*

Years.	Reported cases.	Deaths.	Deaths per 100 cases.	Deaths per 100,000 population.
1900	2,706	535	19.8	22.1
1901	2,498	509	20.4	20.7
1902	2,993	489	16.3	19.5
1903	3,670	684	18.6	26.9
1904	3,510	500	14.2	19.3
1905	2,159	467	21.6	17.8
1906	3,648	469	12.9	17.6
1907	2,935	414	14.1	15.3
Annual average, 1900–1907	3,015	508	16.8	19.8
1908	2,658	346	13.0	12.6
1909	3,109	402	12.9	14.4
1910	3,433	495	14.4	17.6
1911	3,762	472	17.1	16.5
1912	3,294	467	14.2	16.1
1913	5,505	676	12.3	23.0
1914	5,149	512	9.9	17.2
1915	4,386	361	8.2	12.0
Annual average, 1908–1915	3,787	466	12.3	16.2

THE DISTRIBUTION OF FATAL CASES OF DIPHTHERIA IN THE URBAN AND RURAL DISTRICTS OF MICHIGAN.

In Table 15 is shown the distribution of the deaths from diphtheria in the rural districts (all territory exclusive of cities having 10,000 or more inhabitants in 1900) and in the urban districts, in the aggregate, and in each of the cities comprising the latter district, for each of the years, 1900-1915.

In this table, as in Table 14, the data has been divided into two eight year periods, for comparison. In the rural districts, the annual average death rate for the eight year period, 1900-1907, was 15.9, while the average rate for the eight years following, was 12.2, the difference between the two rates representing a decrease of 24.5 per cent in the prevalence of this disease in the rural districts. In the urban districts the annual average death rate for the years, 1900-1907, was 27.9 per 100,000 population, while the rate for the years, 1908-1915, was 22.8, or which is equivalent to a decrease, as between the two rates, of 18.3 per cent. Thus, it will be noted, that the death rate from diphtheria was not only greater in the urban districts than in the rural, for these two periods of years, but the percentage of decrease in the death rates of the urban localities, as between the two periods of years, was less by 33.6 per cent than was the percentage of decrease in the rates for the rural districts.

The cities, constituting the urban localities, shown in Table 15, in which diphtheria has been unusually prevalent during the years, 1908-1915, compared with the average death rate for the total of the urban districts for the same period, are: Detroit, Ironwood and Ishpeming.

TABLE 15.—*Showing the deaths and death rates per 100,000 population from diphtheria and and in each of the cities comprising the urban*

Localities.		1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.
STATE OF MICHIGAN (Urban and Rural Localities)	**Deaths**	**535**	**509**	**489**	**684**	**500**	**467**	**469**	**414**
	Rate	**22.1**	**20.7**	**19.5**	**26.9**	**19.3**	**17.8**	**17.6**	**15.3**
TOTAL FOR RURAL LOCALITIES—	**Deaths**	**310**	**350**	**230**	**318**	**275**	**229**	**246**	**232**
	Rate	**18.3**	**20.6**	**13.5**	**18.5**	**15.9**	**13.2**	**14.1**	**13.2**
TOTAL FOR URBAN LOCALITIES*—	**Deaths**	**225**	**159**	**259**	**366**	**225**	**238**	**223**	**182**
	Rate	**30.7**	**20.8**	**32.6**	**44.4**	**26.3**	**26.9**	**24.3**	**19.2**
Adrian	Deaths	2	1	0	2	4	1	0	2
	Rate	20.7	10.2	......	20.0	39.6	9.8	......	19.1
Alpena	Deaths	10	2	6	1	2	0	0	1
	Rate	84.7	16.8	50.0	8.3	16.4	......	......	8.0
Ann Arbor	Deaths	1	3	2	1	2	0	3	0
	Rate	6.9	20.6	13.7	6.8	13.7	......	20.4	......
Battle Creek	Deaths	1	2	30	9	8	3	1	7
	Rate	5.4	10.4	150.2	43.5	37.5	13.6	4.4	30.0
Bay City	Deaths	25	13	4	15	16	7	4	10
	Rate	61.3	31.5	9.6	35.6	37.6	16.3	9.2	22.8
Detroit	Deaths	83	53	134	222	141	118	86	80
	Rate	28.9	17.4	41.4	64.9	39.2	31.2	21.7	19.3
Escanaba	Deaths	2	1	3	12	2	0	1	3
	Rate	20.9	10.1	29.1	112.3	18.1	......	8.5	24.7
Flint	Deaths	2	3	3	4	2	0	12	0
	Rate	15.0	18.9	16.2	19.0	8.5	......	41.7	......
Grand Rapids	Deaths	24	23	9	19	12	34	55	29
	Rate	27.3	25.5	9.7	19.9	12.3	33.9	53.4	27.5
Ironwood	Deaths	5	5	12	15	2	4	1	8
	Rate	51.4	49.8	115.8	140.5	18.2	35.4	8.6	67.0
Ishpeming	Deaths	7	1	13	15	5	3	0	5
	Rate	52.8	7.6	99.3	115.3	38.7	23.3	......	39.4
Jackson	Deaths	2	1	3	3	5	12	11	5
	Rate	7.1	3.9	11.3	11.1	18.0	42.3	37.9	16.9
Kalamazoo	Deaths	2	0	8	2	5	4	7	1
	Rate	8.2	......	29.0	6.9	16.3	12.4	20.8	2.8
Lansing	Deaths	12	8	1	7	2	5	0	1
	Rate	72.2	44.2	5.1	33.2	8.9	20.8	......	3.7
Manistee	Deaths	4	3	4	3	4	7	1	1
	Rate	28.1	21.3	28.9	21.9	29.6	52.6	7.6	7.7
Marquette	Deaths	1	0	0	10	1	0	3	4
	Rate	9.9	......	......	95.2	9.4	......	27.4	36.1
Menominee	Deaths	1	3	3	4	0	3	0	1
	Rate	7.8	23.9	24.3	33.0	......	25.7	......	8.9

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*The term "Urban" as here used is restricted to those municipalities having 10,000 or more inhabitants in 1900; smaller places being included with the "Rural localities."

croup for the total rural localities (see footnote), and for the total urban localities of Michigan, localities, during each of the years, 1900 to 1915.

Total deaths and annual average death rate, 1900–1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	Total deaths and annual average death rate, 1908–1915.	Per cent increase (+) or decrease (−) in the death rate between 1900 to 1907 and 1908 to 1915.
4,067 19.8	346 12.6	402 14.4	495 17.6	472 16.5	467 16.1	676 23.0	512 17.2	361 12.0	3,731 16.2	−18.3
2,190 15.9	190 10.8	214 12.1	257 14.4	215 12.1	193 10.7	266 14.7	241 13.3	175 9.6	1,751 12.2	−24.5
1,877 27.9	156 16.0	188 18.6	238 22.9	257 24.0	274 24.9	410 36.2	271 23.3	186 15.6	1,980 22.8	−18.3
12 14.9	1 9.5	0	0	5 45.9	1 9.1	2 18.0	0	0	9 10.3	−30.9
22 22.7	11 87.7	7 55.4	0	1 7.8	3 23.2	1 7.7	0	0	23 22.4	−1.3
12 10.3	0	2 13.5	0	1 6.7	2 13.4	1 6.7	4 26.8	0	10 8.4	−18.4
61 36.3	0	2 8.1	3 11.8	4 15.3	8 29.9	7 25.5	3 10.7	2 6.9	29 13.7	−62.3
94 27.7	5 11.3	5 11.2	4 8.8	7 15.3	4 8.7	2 4.3	6 12.8	9 18.9	42 11.4	−58.8
917 32.7	69 15.9	109 24.2	159 33.9	167 34.3	187 37.0	300 57.3	157 29.0	114 20.3	1,262 31.8	−2.8
24 27.6	7 55.9	2 15.5	10 75.4	5 36.7	2 14.3	3 20.9	1 6.8	0	30 27.1	−1.8
26 14.5	1 2.9	1 2.7	6 15.3	5 12.0	1 2.3	8 17.1	12 24.3	10 19.2	44 12.8	−11.7
205 25.2	12 11.1	9 8.1	12 10.6	12 10.4	15 12.7	53 43.9	33 26.8	15 11.9	161 17.2	−31.7
52 63.7	8 65.3	18 143.2	7 54.3	1 7.6	0	0	2 14.1	0	36 33.7	−47.1
49 47.2	16 126.9	10 79.8	6 48.2	6 48.5	1 8.1	2 16.4	1 8.2	3 24.9	45 45.6	−3.4
42 19.1	2 6.6	3 9.7	2 6.3	5 15.5	17 51.8	3 9.0	3 8.8	6 17.3	41 15.8	−17.3
29 12.1	1 2.7	2 5.3	1 2.5	2 4.8	7 16.4	3 6.8	4 8.7	2 4.2	22 6.5	−46.3
36 20.6	6 21.0	5 16.6	2 6.3	1 3.0	3 8.7	5 13.9	3 8.0	7 17.7	32 11.8	−42.7
27 24.8	0	0	3 24.2	2 16.4	0	1 8.5	8 68.8	1 8.6	15 15.5	−37.9
19 22.4	1 8.9	2 17.6	0	3 25.7	1 8.5	1 8.4	1 8.3	0	9 9.6	−57.1
15 15.6	2 18.2	0	1 9.5	2 19.5	0	0	1 10.4	0	6 7.4	−52.6

TABLE 15.—

Localities.		1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.
Muskegon	Deaths	3	1	6	1	2	4	5	4
	Rate	14.4	4.7	27.9	4.6	9.0	17.8	21.9	17.3
Pontiac	Deaths	4	1	2	6	2	1	1	3
	Rate	40.8	9.7	18.6	53.3	17.0	8.2	7.9	22.8
Port Huron	Deaths	4	7	1	5	2	12	12	1
	Rate	20.9	36.6	5.2	26.2	10.5	63.1	63.2	5.3
Saginaw	Deaths	15	19	8	6	6	17	20	9
	Rate	35.4	43.9	18.2	13.4	13.1	36.5	42.2	18.7
Sault Ste. Marie	Deaths	13	8	4	4	0	2	0	5
	Rate	123.2	74.3	36.4	35.8	......	17.2	......	41.6
Traverse City	Deaths	2	1	3	0	0	1	0	2
	Rate	21.2	10.3	30.1	......	......	9.3	......	17.6

Concluded.

Total deaths and annual average death rate, 1900–1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	Total deaths and annual average death rate, 1908–1915.	Per cent increase (+) or decrease (−) in the death rate between 1900 to 1907 and 1908 to 1915
26 14.8	3 12.8	0	1 4.1	1 4.1	0	2 8.0	4 15.7	2 7.8	13 6.6	−55.4
20 21.7	1 7.3	4 28.3	4 27.3	3 19.8	2 12.8	2 12.4	5 30.2	11 64.5	32 26.0	+19.8
44 28.9	0	0	11 58.3	2 10.6	2 10.6	5 26.6	7 37.3	0	27 17.9	−38.1
100 27.6	6 12.2	4 8.0	4 7.9	18 36.1	12 22.9	6 11.3	5 9.3	3 5.5	58 14.0	−49.2
36 39.9	4 32.7	3 24.1	1 7.7	4 31.1	4 30.5	3 22.6	7 51.9	1 7.3	27 26.0	−20.5
9 10.8	0	0	1 8.2	0	2 15.7	0	4 30.1	0	7 7.0	−35.2

DIAGRAM SHOWING THE PREVALENCE OF DIPHTHERIA AND CROUP IN MICHIGAN DURING SIXTEEN YEARS 1900-1915.

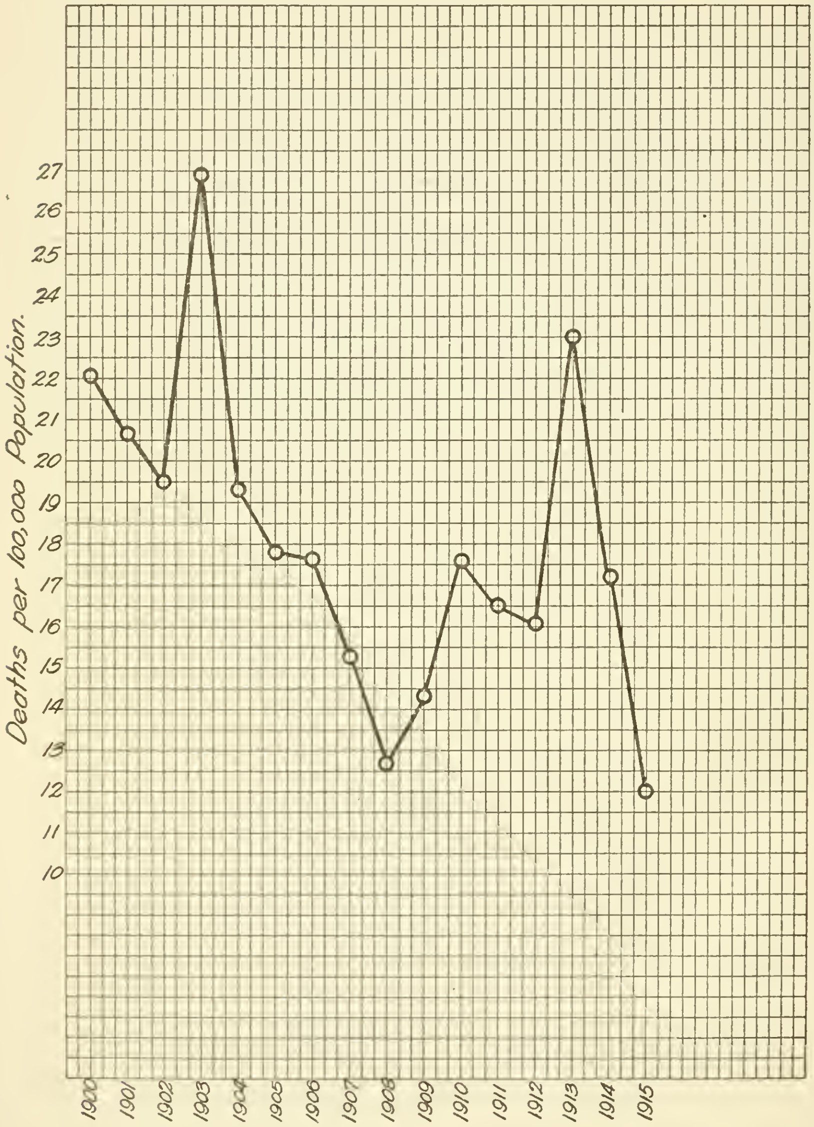
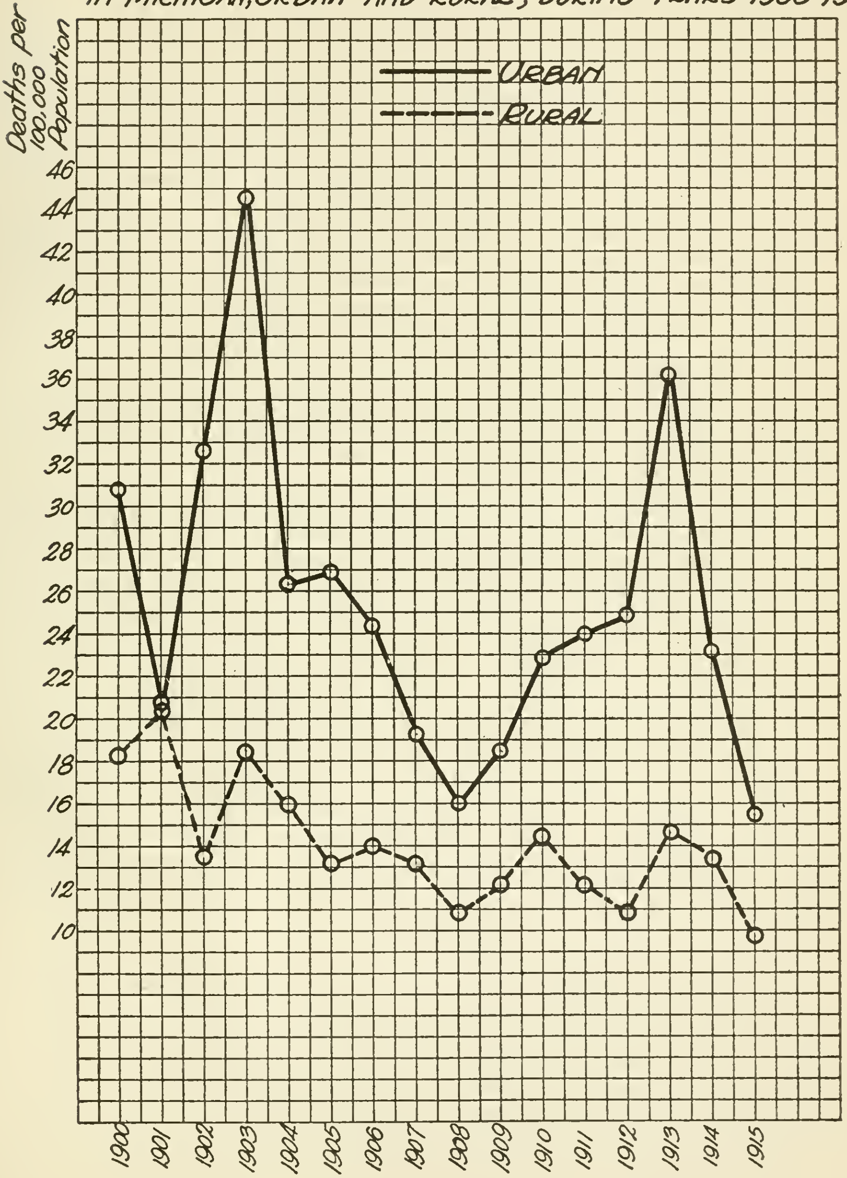


DIAGRAM SHOWING PREVALENCE OF DIPHTHERIA AND CROUP IN MICHIGAN, URBAN AND RURAL, DURING YEARS 1900-1915.



According to the data in the above table, during the six years, 1904-1909, there were on the average for that period, 167.7 persons, out of each 100,000 population, taken sick annually in the urban districts. During the six years ending with 1915, this attack rate increased to 250.8 persons per 100,000 population in these districts. In the rural districts of the state, there were, on the average for the years, 1904-1909, 83 persons taken sick annually out of each 100,000 of its population. While, during the years, 1910-1915, the attack rate dropped to 80.8 per 100,000 population. From these comparisons, it would seem that the susceptibility or probability of an attack from diphtheria increased 50 per cent in the urban districts, and decreased 2.7 per cent in the rural. The increase of 50 per cent in the attack rate in the urban districts is, perhaps, due more to the reporting of a larger proportion of the non-fatal cases in the later period than were reported during the years, 1904-1909, rather than to an increase in the susceptibility of its population to this disease.

A comparison of the average attack rates for the urban and rural districts, for the years, 1914-1915, would indicate that the probability of contracting diphtheria was 2.6 times greater in urban than in rural districts. This comparatively high attack rate in the urban districts is due, in the main, to the fact that the population of the same contains a greater proportion of children under ten years of age, and who are most susceptible to the disease, than are contained in the population of the rural districts.

In the following table are shown the number of cases of diphtheria per 100,000 population and the case fatality rates (deaths per 100 cases) in both the urban and rural districts of the state, for the two six year periods, 1904-1909 and 1910-1915, for comparison. As these case rates indicate the probability or susceptibility of these populations to attack from diphtheria, a comparison of the same, as between the urban and rural populations, would show which of the two populations, as a whole, are the more liable to contract the disease; and a comparison of the case rates for the two periods of years for the same population would show any change in the probability or susceptibility of this population to an attack from diphtheria, as between these two periods of years. Similar comparisons of the fatality rates would indicate the comparative probability of dying after being attacked with the disease, as between the populations of the urban and rural districts; and the comparative probability of dying after attack, as between the two periods, for the same population:

URBAN DISTRICTS.

Years.	Cases reported.	Number of attacks per 100,000 population.	Number of deaths.	Deaths per 100 cases.
1904–1909	9,374	167.7	1,212	12.9
1910–1915	16,799	250.8	1,636	9.7
1904–1915	26,173	212.9	2,848	10.9

RURAL DISTRICTS.

Years.	Cases reported.	Number of attacks per 100,000 population.	Number of deaths.	Deaths per 100 cases.
1904–1909	8,645	83.0	1,386	16.0
1910–1915	8,730	80.8	1,347	15.4
1904–1915	17,375	81.9	2,733	15.7

A comparison of the case fatality rates for the urban districts, as between the two periods of years, shows that the probability of dying from diphtheria, after attack, has been reduced 24.8 per cent in these localities during the six years ending with 1915; while, by the same comparison, the reduction in the fatality from this disease amounted to only 3.8 per cent in the rural districts.

As indicated by the average case fatality rates for the urban and rural districts, for the twelve years, 1904-1915, the probability of dying from diphtheria, after attack, is 29 per cent less in the urban than in the rural districts.

Thus, it will be noted that, while the probability of dying from diphtheria, without regard to an attack of the disease, and without regard to age constitution of the two populations, is 80 per cent greater among the urban population than among the rural (which fact is indicated by the average death rates per 100,000 population for the two districts during the years, 1900-1915, shown in Table 15) ; and while the probability that the population of the urban districts will suffer an attack of diphtheria 2.6 times greater as compared with the rural population, still, notwithstanding these facts, the probability of a person dying from diphtheria, after attack, is 29 per cent less in the urban than in the rural localities. The fact that the probability of dying from diphtheria, after attack, is so much less in cities than in rural districts, is explained in part, if not wholly, by the fact that persons living in cities are enabled to obtain the services of a physician with much greater facility than are people living in country districts, and as the efficacy of the antitoxin treatment of this disease decreases with the time elapsing between the day or hour taken sick and the administration of the same, the difference in the fatality of the disease, as between the urban and rural districts, should be expected.

AGE DISTRIBUTION OF FATAL CASES OF DIPHTHERIA, IN MICHIGAN, AND THE COMPARATIVE PROBABILITY OF DYING FROM THIS DISEASE, WITHOUT REGARD TO ATTACK, AS BETWEEN THE VARIOUS AGE GROUPS.

In Table 16 is shown the age distribution of the fatal cases of diphtheria that occurred in Michigan during the two eight year periods, 1900-1907 and 1908-1915, as indicated by the per cent of deaths at each age group to the total deaths at all ages, for comparison. In this table is also shown the comparative probability of dying from diphtheria, without regard to attack, as between the age groups during each of the two periods of years, and as between the two periods of years for those of the same ages, as indicated by the relation of the death rates per 100,000 population of corresponding ages for each age group for the two periods of years, and by the relation of the death rates as between the two periods of years for those of the same ages, respectively.

As will be seen, by reference to the above table, that of all the deaths from diphtheria that occurred in Michigan during the eight years, 1900-1907, practically 50 per cent occurred among children 5 years of age; 30 per cent among children aged 5-9, and 15 per cent among persons aged 10-19, while the balance, or 5 per cent, were distributed throughout the older age groups. During the following eight years, 1908-1915, these percentages show slight decreases at the younger ages, except at the age group 5-9, and increases in the per cent among those of the older ages.

In the column captioned "Deaths per 100,000 population of corresponding ages," it will be noted that the death rate at all ages for the period, 1908-1915, was 18.3 per cent less than the rate for the period, 1900-1907. Expressed in actual deaths, this reduction means that there occurred during the years 1908-1915, 827 fewer deaths than would have been the case had the death rate for the earlier period of years obtained throughout the later period. Considered by age groups, it will be noted that children under five years of age are more liable to death from this disease, without regard to an attack of the same, than are those living at any of the other age groups, the liability of dying from diphtheria at this age being almost five times greater than on the average for all ages; almost three times greater than for children aged from 5-9, and almost six times greater for persons aged from 10-19 years, during the years, 1900-1907. After the 29th year of life the chances of dying from this disease, without regard to attack, is practically nil, the chances being about one in 100,000. During the years, 1908-1915, the death rates for the age groups under 30 years show considerable decreases, compared with the same for the former eight year period, the reductions in the same ranging from 5.7 per cent, at the age group 5-9, to 27.8 per cent, at the age group 10-19 years. By the same comparison, increases will be noted in the death rates for each of the age groups after the 30th year, with but two exceptions, 60-69 and 80 years and over.

As previously stated, the populations of the urban districts contain a greater proportion of children under 10 years of age than are to be found in the populations of the rural districts, and this fact, together with what has been stated regarding the excessive death rates among children of that age, will explain the reason for the excessive death rates in the urban districts as compared with those of the rural localities.

TABLE 16.—*The age distribution of decedents from diphtheria, in Michigan, for the two eight-year periods, 1900 to 1907 and 1908 to 1915, as indicated by the per cent of deaths at each age group to the total deaths at all ages; also showing the ratio of deaths at each age group to each 100,000 of population of corresponding ages, for the two periods of years.*

Age groups.	1900–1907.		1908–1915.		Deaths per 100,000 population of corresponding ages.		Per cent. Increase (+) or decrease (–), between 1900 to 1907 and 1908 to 1915
	Deaths.	Per cent.	Deaths.	Per cent.	1900–1907.	1908–1915.	
ALL AGES	4,067	100.00	3,731	100.00	19.8	16.2	–18.3
Under 5 years	2,025	49.79	1,822	48.83	92.2	74.6	–19.1
5–9 years	1,207	29.68	1,177	31.55	56.3	53.4	–5.7
10–19 years	629	15.47	484	12.97	15.8	11.4	–27.8
20–29 years	109	2.68	118	3.16	3.0	2.8	–6.7
30–39 years	41	1.01	53	1.42	1.4	1.6	+14.3
40–49 years	27	0.66	44	1.18	1.2	1.7	+41.7
50–59 years	13	0.32	19	0.51	0.8	1.0	+25.0
60–69 years	8	0.20	8	0.21	0.8	0.6	–25.0
70–79 years	2	0.05	4	0.11	0.4	0.8	+100.0
80 years and over	1	0.02	1	0.03	0.8	0.6	–25.0
Unknown ages	5	0.12	1	0.03	....	....	....

MONTHLY PREVALENCE OF DIPHTHERIA IN MICHIGAN.

In Table 17 is shown the monthly prevalence of diphtheria in Michigan, based on the number of deaths that occurred in each month during the years, 1910-1915, inclusive.

As the number of days in each month vary, corrections must be made for these variations in order to obtain the true monthly incidence of this disease, and as the figures in the last column of this table allow for these variations, by reducing the deaths to a standard of 100, the same should be employed in determining the monthly incidence of this disease. It will be noted, according to these figures, that the deaths from this disease were above the standard number during the months of from October to February, inclusive, and below the standard during the balance of the months, the maximum number having been recorded in the month of October and the minimum number in May.

TABLE 17.—*Seasonal prevalence of diphtheria, in Michigan, as indicated by the number of deaths from this disease in each month during the six years, 1910–1915.*

Month.	Total number of deaths occurring in each month during the years 1910–1915.	Monthly deaths reduced to a standard of 100.
January	305	120.0
February	250	106.3
March	247	97.2
April	225	91.5
May	180	70.9
June	189	76.9
July	183	72.0
August	182	71.7
September	242	97.6
October	352	138.6
November	337	136.7
December	291	114.6
Total deaths, 1910–1915	2,983	100.0

PNEUMONIA IN MICHIGAN IN 1915 AND PRECEDING YEARS.

GENERAL PREVALENCE.

Table 18 of this report shows the general prevalence of pneumonia in Michigan for each of the years, 1898-1915. During the year 1915 there were reported to this Department 4,022 cases of pneumonia, of which number 3,132 or 77.9 per cent proved fatal. These deaths correspond to an annual death rate of 102.9 per 100,000 population.

As indicated by the death rates, pneumonia was more prevalent in this State in 1915 than it was in 1914, but pneumonia (all forms) in 1915 caused 89,326 deaths in the registration area, as against 83,804 in 1914. The rate for the later year was 132.7 per 100.000 population, which represents an increase of 4.5 per cent over that of the earlier one, 127 per 100,000 population. Although Michigan's death rate for 1915 was higher than in 1914, it is still considerable less than the average of the States in the registration area, which are given below.

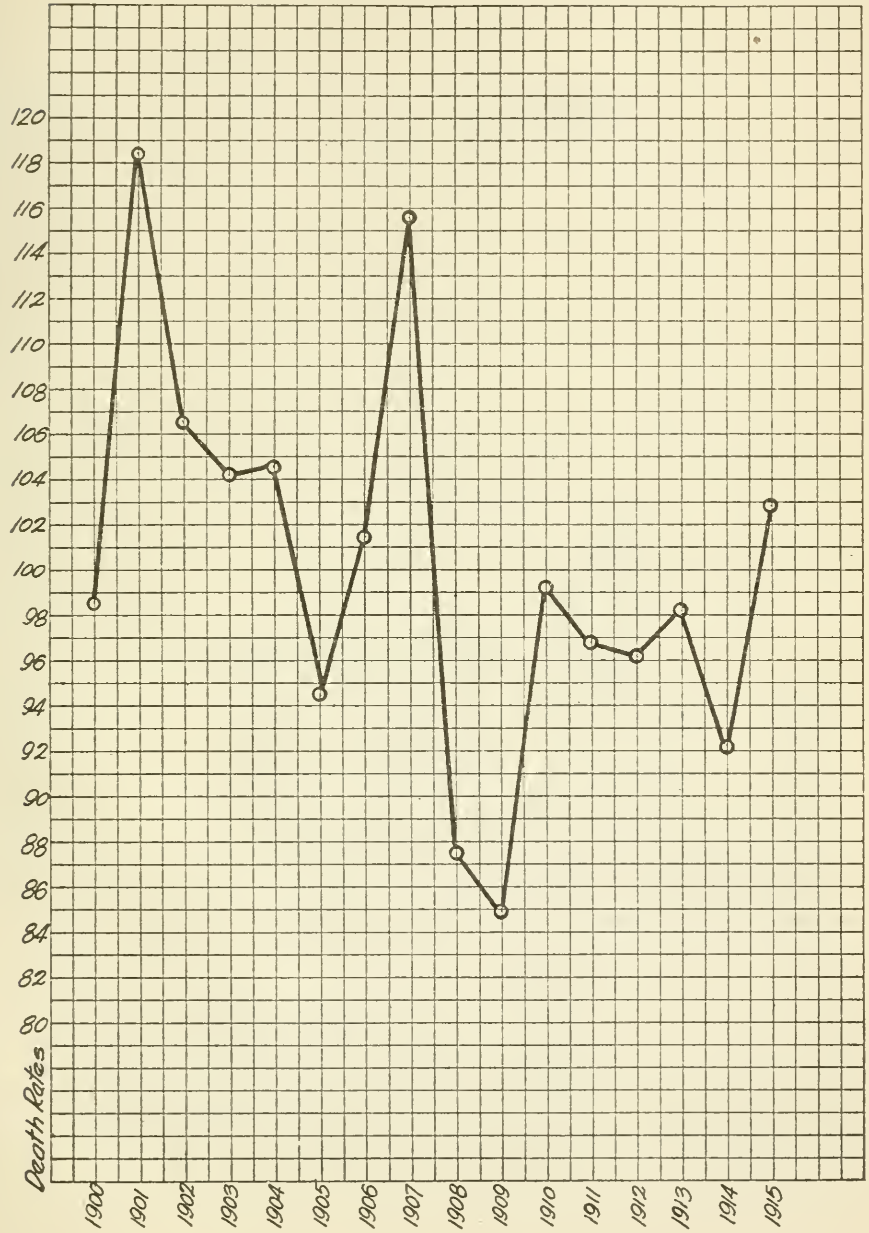
Average death rate for all Registration States in 1915 was 132.7 per 100,000 population; New York, 166.9; Rhode Island, 164.9; Massachusetts, 160.6; Maryland, 159.2; Connecticut, 155.4; Kentucky, 98; California, 97.4; Minnesota, 89.6; Kansas, 86.3; and Washington, 57.1. The above states mentioned are the five highest and five lowest of the registration area.

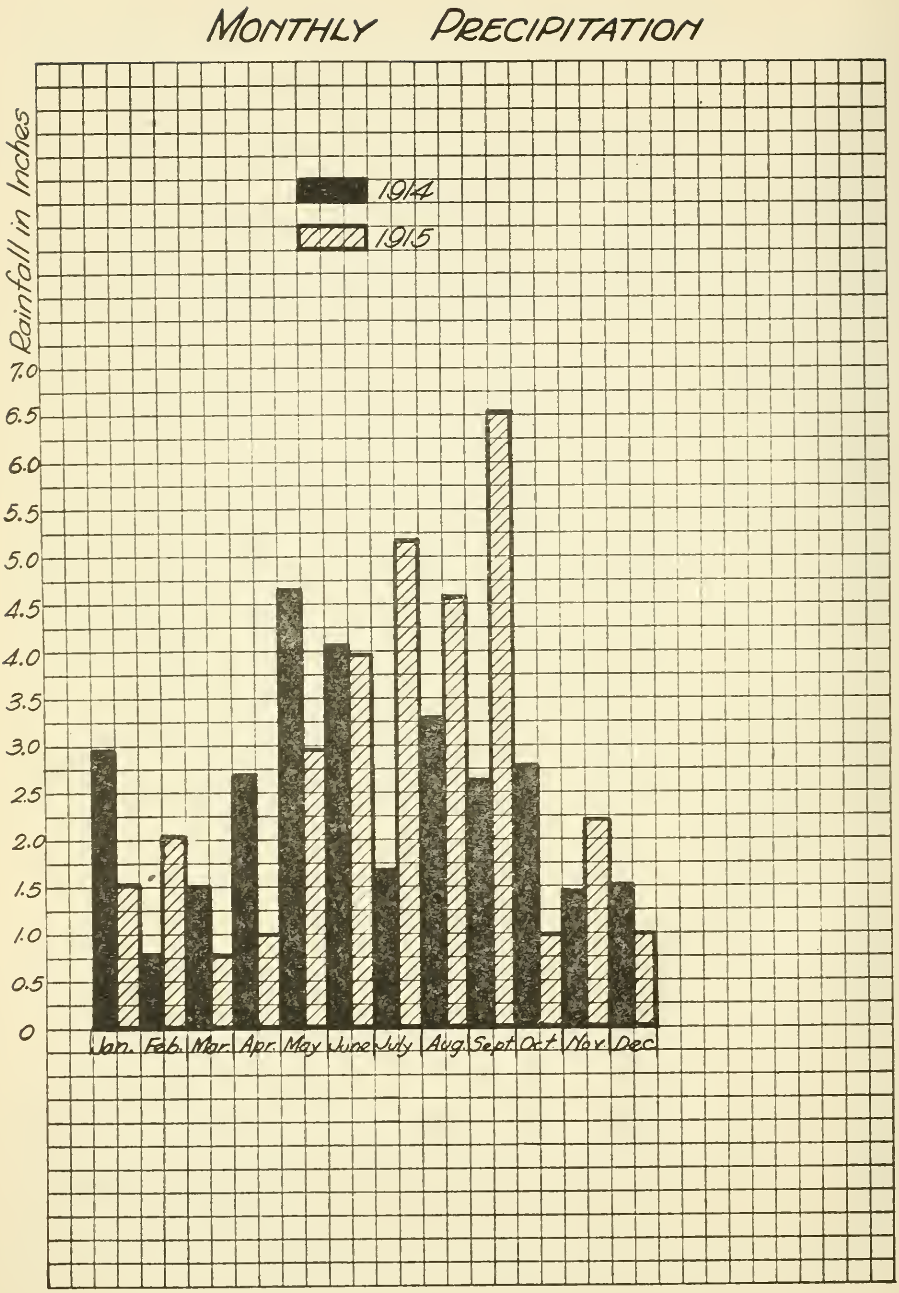
TABLE 18.—*The prevalence of pneumonia, in Michigan, in each of the eighteen years, 1898–1915.*

Years.	*Cases.	Deaths.	Deaths per 100,000 population.
1898		2,047	86.7
1899		2,479	103.7
1900		2,388	98.6
1901		2,901	118.4
1902		2,637	106.5
Average, 1898–1902		2,490	102.9
1903		2,607	104.2
1904	3,790	2,646	104.6
1905	3,227	2,417	94.5
1906	3,387	2,621	101.4
1907	3,976	3,018	115.6
Average, 1903–1907	3,595	2,662	104.1
1908	3,177	2,313	87.6
1909	3,142	2,265	84.9
1910	3,671	2,785	99.1
1911	3,452	2,763	96.7
1912	3,592	2,796	96.3
Average, 1908–1912	3,407	2,584	93.1
1913	3,687	2,894	98.1
1914	3,470	2,751	92.4
1915	4,022	3,132	102.9

*Previous to 1904 pneumonia was not reported to this Department.

DIAGRAM SHOWING THE DEATH RATES PER 100 000 POPULATION, FROM PNEUMONIA, IN MICHIGAN, 1900-1915.




MONTHLY PRECIPITATION
1914
1915
Rainfall in Inches
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
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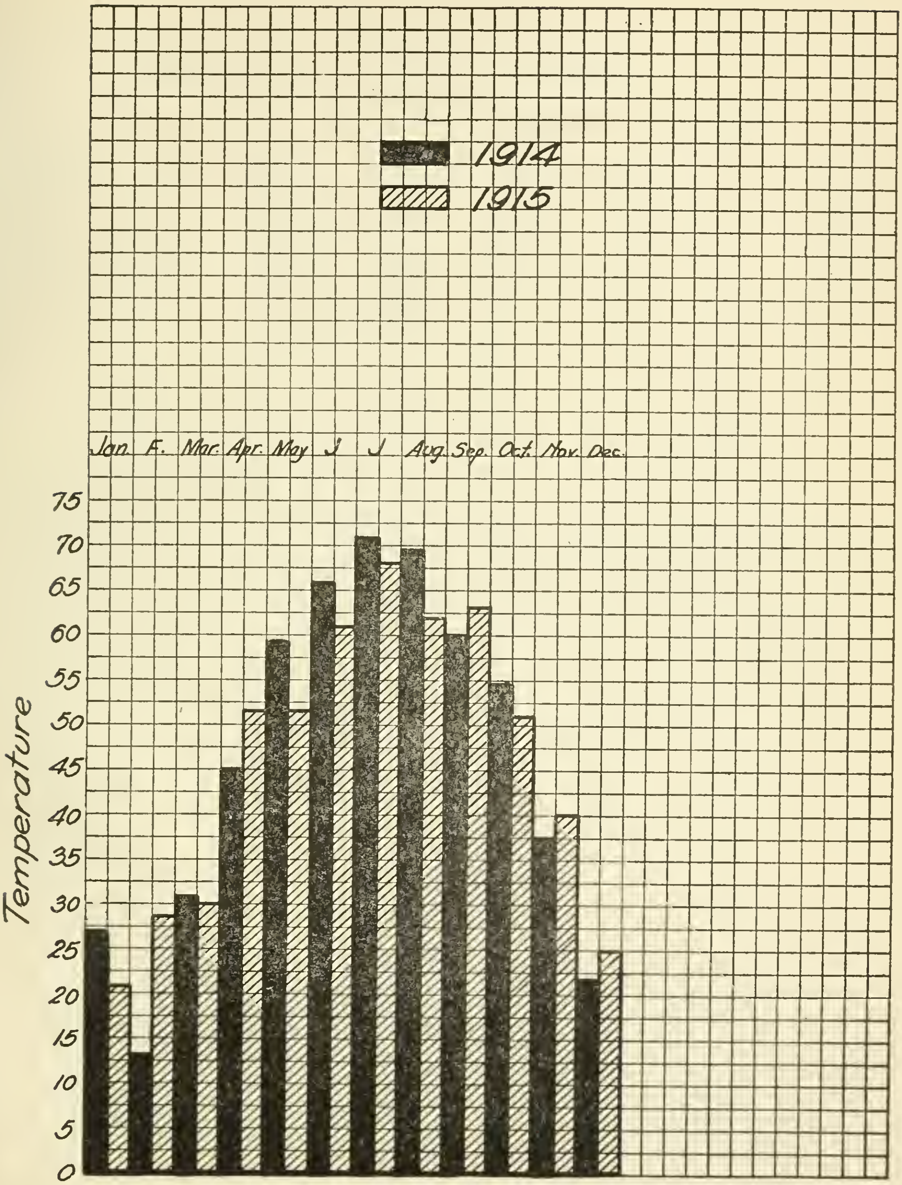


AVERAGE MONTHLY TEMPERATURES

TABLE 19.—*Showing the deaths and death rates for two series of years, 1900–1907 and 1908–1915, for pneumonia; also the per cent of increase or decrease in the States named, for these two periods.*

States.	1900–1907.		1908–1915.		Per cent increase or decrease.
	Deaths.	Deaths per 100,000 population.	Deaths.	Deaths per 100,000 population.	
Vermont	4,414	158.5	3,804	132.8	−16.2
Rhode Island	6,711	178.5	7,094	157.7	−11.7
New York	123,485	194.4	129.890	171.9	−11.6
Michigan	**20,951**	**102.2**	**21,207**	92.1	−9.9
New Hampshire	5,004	149.5	4,684	135.0	−9.7
New Jersey	27,970	164.9	32,448	153.0	−7.2
Connecticut	10,762	136.8	13,421	145.8	−6.6
Indiana	21,272	102.9	22,205	101.6	−1.3
Massachusetts	36,953	153.5	43,056	154.6	+0.7
Maine	8,176	143.6	8,733	145.4	+1.3

GEOGRAPHICAL DISTRIBUTION OF PNEUMONIA.

As indicated by the death rates, Table 20 shows the prevalence of pneumonia by geographical sections of the State, also the prevalence in the counties constituting each of the sections, during the years 1915 and the annual average death rates for the years 1904-1914.

The Southern section of the state has the highest death rate of any of the sections in 1915, as in other years, the Northern counties have the lowest death rate for 1915, they also have the lowest average death rate. The high rate in the Southern section of counties is influenced by the excessively high rate in Wayne county. The Upper Peninsula and Northern section of counties show a decrease in the prevalence of this disease in 1915 as compared with their average annual rate, the decreases in these counties were 15.8 and 16.2 per cent respectively, while the Central and Southern sections rates increased in 1915 over that of their average annual rates, 8.5 and 13.8 per cent respectively, while on a whole the State death rate for 1915 was 5.8 per cent greater than its average annual rate.

The counties having unusually high death rates from pneumonia in 1915 as compared with the rate for the State for the same year (102.9) were, Wayne (186.3), Montmorency (151.7), Roscommon (158.1), Alger (139.1), Delta (143.9), Muskegon (145.7), Oceana (132.1), Livingston (129.6), and Luce (121.8).

The counties having unusually low death rates for 1915 were: Schoolcraft (20.6), Ontonagon (30.0), Mackinac (39.7), Charlevoix (32.5), Clare (32.3), Emmet (31.4) Gladwin (36.3), Lake (20.5), Leelanau (19.2),Osceola (46.3), Eaton (39.6), Mecosta (37.2), and Newaygo (45.3).

TABLE 20.—*Showing the cases, deaths and death rates per 100,000 population from pneumonia, in each of the counties of the State, for the year 1915, also the averages for the years 1904–1914, inclusive.*

State and counties by geographical sections.	1915.			Average, 1904–1914.		
	Cases.	Deaths.	Deaths per 100,000 population.	Cases.	Deaths.	Deaths per 100,000 population.
STATE	**4,022**	**3,132**	**102.9**	**3,500**	**2,661**	**97.3**
I.—Upper Peninsula	**418**	**271**	**73.8**	**374**	**281**	**87.7**
Alger	13	12	139.1	8	7	93.0
Baraga	8	7	100.3	5	5	83.6
Chippewa	22	21	79.5	29	23	95.0
Delta	45	47	143.9	37	34	111.1
Dickinson	29	14	64.0	18	15	73.8
Gogebic	22	21	74.0	19	18	78.9
Houghton	65	53	51.6	103	77	89.2
Iron	23	11	54.1	16	13	88.6
Keweenaw	9	5	53.6	12	5	73.1
Luce	5	5	121.8	5	5	127.5
Mackinac	8	4	39.7	6	6	65.8
Marquette	109	34	65.0	69	39	84.2
Menominee	17	16	64.0	25	22	85.3
Ontonagon	4	3	30.0	10	5	59.2
Schoolcraft	39	18	20.6	12	7	81.2
II.—Northern Counties	**278**	**219**	**65.5**	**372**	**255**	**78.2**
Alcona	4	4	70.0	5	3	52.6
Alpena	14	14	69.5	20	19	96.3
Antrim	13	11	70.0	17	11	70.0
Arenac	8	8	87.1	9	8	87.1
Benzie	19	10	95.1	11	9	85.2
Charlevoix	10	7	32.5	20	12	64.0
Cheboygan	11	12	65.3	19	15	84.8
Clare	4	3	32.3	10	5	54.5
Crawford	5	3	75.0	5	4	103.8
Emmet	5	6	31.4	21	15	81.7
Gladwin	6	3	36.3	6	5	60.5
Grand Traverse	24	22	90.6	25	18	76.5
Iosco	12	10	109.9	7	6	61.3
Kalkaska	8	7	82.2	6	5	62.4
Lake	2	1	20.5	5	3	60.7
Leelanau	2	2	19.2	9	7	66.0
Manistee	21	17	64.7	49	22	82.0
Mason	28	13	54.9	22	17	78.7
Missaukee	9	6	55.1	13	12	114.3
Montmorency	6	6	151.7	6	3	80.8
Ogemaw	10	10	106.5	11	9	102.1
Osceola	11	8	46.3	21	13	72.7
Oscoda	4	2	88.3	5	2	100.9
Otsego	7	6	89.4	8	6	92.0
Presque Isle	10	9	77.8	10	8	72.4
Roscommon	5	4	158.1	4	2	89.5
Wexford	20	15	68.0	28	16	78.2
III.—Central Counties	**523**	**412**	**89.3**	**483**	**385**	**82.3**
Bay	83	75	103.8	73	65	95.9
Gratiot	33	23	84.0	35	25	86.5
Huron	32	24	69.4	31	27	77.8
Isabella	25	15	67.8	37	20	86.9
Mecosta	18	7	37.2	22	15	76.7
Midland	24	12	89.2	15	13	92.6
Montcalm	25	23	73.8	31	25	77.8
Muskegon	72	63	145.7	46	38	94.3
Newaygo	10	9	45.3	17	11	57.6
Oceana	36	25	132.1	20	15	82.1
Saginaw	97	83	90.0	86	77	86.8
Sanilac	23	19	57.3	32	25	73.5
Tuscola	45	34	99.9	38	29	82.9

TABLE 20.—*Concluded.*

Counties by geographical sections.	1915.			Average, 1904–1914.		
	Cases.	Deaths.	Deaths per 100,000 population.	Cases.	Deaths.	Deaths per 100,000 population.
IV.—Southern Counties	**2,803**	**2,230**	**118.6**	**2,271**	**1,747**	**104.2**
Allegan	57	34	83.9	41	29	72.7
Barry	18	11	47.5	23	15	66.3
Berrien	47	36	63.0	48	32	60.1
Branch	15	14	56.1	24	15	58.2
Calhoun	67	41	68.7	84	47	83.9
Cass	21	19	90.0	21	16	77.5
Clinton	38	25	116.8	27	17	73.0
Eaton	14	12	39.6	39	25	81.8
Genesee	135	68	82.2	80	55	87.7
Hillsdale	26	24	81.3	31	21	70.7
Ingham	77	50	81.4	55	34	65.1
Ionia	45	37	113.0	37	28	83.3
Jackson	83	47	80.1	80	43	81.1
Kalamazoo	109	64	92.3	115	61	103.2
Kent	279	168	95.3	180	137	87.4
Lapeer	47	28	111.2	46	29	110.9
Lenawee	48	32	68.2	52	39	81.3
Livingston	26	22	129.6	23	14	78.1
Macomb	39	18	55.8	36	29	88.8
Monroe	43	30	91.1	39	31	94.2
Oakland	73	55	104.2	70	49	99.6
Ottawa	48	35	73.1	48	29	64.7
St. Clair	51	40	80.7	61	46	87.5
St. Joseph	15	15	54.8	25	23	90.7
Shiawassee	27	22	67.0	36	22	66.1
Van Buren	41	27	85.2	38	26	78.3
Washtenaw	53	41	95.4	53	38	84.5
Wayne	1,261	1,215	186.3	859	797	154.2

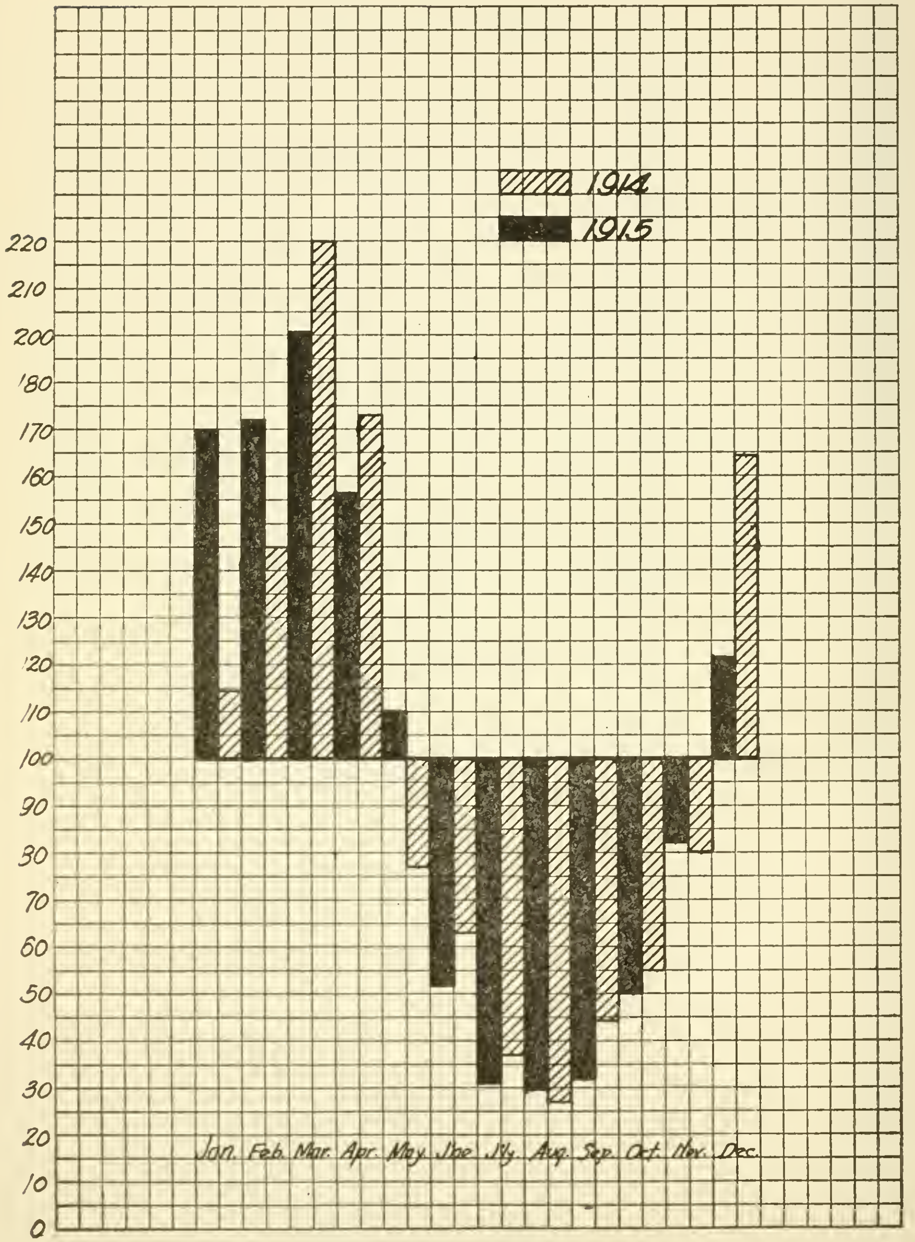
SEASONAL PREVALENCE OF PNEUMONIA.

By reference to Table 21 it will be seen that pneumonia is most prevalent during the winter months and least prevalent during the summer months.

TABLE 21.—*The seasonal prevalence of broncho and other forms of pneumonia, in Michigan, as indicated by the number of deaths from the two forms of this disease during each of the months in 1915, and the average number of deaths in each month during the years 1898–1914.*

	1915.				Average, 1898–1914.			
	Broncho.		Other forms.		Broncho.		Other forms.	
	The number of deaths occurring in each month during the year 1915.	Monthly deaths reduced to a standard of 100.	The number of deaths occurring in each month during the year 1915.	Monthly deaths reduced to a standard of 100.	Average number of deaths occurring in each month during the years 1898–1914.	Monthly deaths reduced to a standard of 100.	Average number of deaths occurring in each month during the years 1898–1914.	Monthly deaths reduced to a standard of 100.
January	86	99.1	219	122.3	77	154.0	278	162.2
February	117	149.8	230	146.4	82	182.0	305	197.2
March	203	233.9	383	214.0	89	178.0	306	178.5
April	152	180.9	303	174.9	70	144.0	253	152.3
May	70	80.6	135	75.4	52	104.0	190	110.8
June	53	63.4	108	62.0	31	64.0	95	57.1
July	24	27.6	73	40.8	17	34.0	53	30.9
August	36	41.5	37	20.7	17	34.0	45	26.2
September	46	55.3	67	38.6	20	42.0	59	35.6
October	44	50.7	104	58.0	30	60.0	93	54.3
November	66	79.5	139	80.4	43	88.0	139	83.4
December	125	144.0	312	174.3	57	114.0	206	120.2
Total	1,022	100.0	2,110	100.0	585	100.0	2,022	100.0

PNEUMONIA - All FORMS
MONTHLY DEATHS REDUCED TO A STANDARD OF 100.



PNEUMONIA IN CITIES OF MICHIGAN OF 10,000 INHABITANTS AND OVER.

Based on the death rates, the prevalence of pneumonia in cities of Michigan of 10,000 inhabitants and over is shown in Table 22.

The highest death rates from this disease seem to prevail in the group of cities having the greatest number of inhabitants. This death rate is influenced to a very great extent by the unusually high rate for the city of Detroit. Grand Rapids and Saginaw, the other two cities of this group, had lower rates than that for the State, as a whole, and which rates were considerably lower than the rates of the cities having less population. The group of cities having from 25,000 to 50,000 inhabitants, had a lower rate in 1915 and a lower average rate than did any of the other groups.

Of the cities shown in the table, those having unusually high death rates in 1915, compared with the rate for the State, for that year, were: Escanaba (180.7), Detroit (175.8), Muskegon (164.8), and Ann Arbor (160.0).

The cities having unusually low death rates in 1915, were: Manistee (49.5), Flint (65.2), Ironwood (66.0), Ishpeming (68.5), Lansing (71.9), Marquette (82.0) and Alpena (69.3).

TABLE 22.—*The deaths and death rates per 100,000 population, from pneumonia, in cities of Michigan, of 10,000 inhabitants and over, in 1915, also the average number of deaths and the rates for the years 1904–1914.*

Cities.	1915.		Average, 1904–1914.	
	Deaths.	Deaths per 100,000 inhabitants.	Deaths.	Deaths per 100,000 inhabitants.
Cities over 50,000	**1,209**	**157.1**	**903**	**155.6**
Detroit	1,036	175.8	751	178.1
Grand Rapids	120	94.8	102	94.9
Saginaw	53	98.6	50	99.6
Cities of 25,000 to 50,000	**272**	**95.7**	**227**	**105.9**
Battle Creek	23	82.7	25	97.8
Bay City	55	112.4	49	116.7
Flint	38	65.2	33	116.4
Jackson	31	84.8	27	94.8
Kalamazoo	52	109.5	47	126.8
Lansing	29	71.9	19	62.6
Muskegon	44	164.8	27	121.8
Cities of 10,000 to 25,000	**183**	**108.3**	**180**	**108.6**
Adrian	9	83.1	11	95.9
Alpena	9	69.4	13	101.7
Ann Arbor	24	160.0	16	104.8
Escanaba	28	180.7	19	149.9
Ironwood	10	66.0	8	68.9
Ishpeming	9	68.5	14	124.3
Manistee	6	49.5	10	87.3
Marquette	10	82.0	13	113.5
Menominee	9	90.0	12	119.1
Pontiac	22	125.2	20	151.1
Port Huron	20	111.8	21	104.2
Sault Ste. Marie	11	82.4	14	112.5
Traverse City	16	118.1	9	75.6

TABLE 23.—*The age distribution of fatal cases of broncho and other forms of pneumonia, in Michigan, as indicated by the number of deaths occurring at each age group in 1915 and the average annual number of deaths at each age group during the years 1898–1914, inclusive.*

	1915.				Average, 1898–1914.			
	Broncho pneumonia.		Other forms of pneumonia.		Broncho pneumonia.		Other forms of pneumonia.	
	The total number of deaths during the year 1915.	Death rates per 100,000 population of same age.	The total number of deaths during the year 1915.	Death rates per 100,000 population of same age.	Average annual number of deaths during the years 1898–1914.	Death rates per 100,000 population of same age.	Average annual number of deaths during the years 1898–1914.	Death rates per 100,000 population of same age.
ALL AGES	1,022	33.6	2,110	69.3	587	22.4	2,021	77.1
Under 1 year	449	680.4	328	497.0	260	431.6	394	656.7
Under 5 years	678	213.5	172	54.2	395	137.2	579	201.2
5 to 9 years	25	8.9	44	15.7	16	5.8	51	19.0
10–19 years	15	2.7	63	11.5	8	1.6	93	18.1
20–29 years	11	2.0	145	26.5	9	2.1	135	29.5
30–39 years	22	5.1	184	42.6	12	3.2	150	40.5
40–49 years	15	4.3	203	58.5	12	4.0	175	59.1
50–59 years	28	10.6	248	94.2	19	9.0	192	90.6
60–69 years	71	43.4	292	178.4	35	24.8	240	178.5
70–79 years	92	118.4	289	371.9	49	75.0	250	392.4
80 years and over	65	323.7	138	690.0	31	175.2	131	767.1
Unknown	....	....	....	....	.3	....	3	....

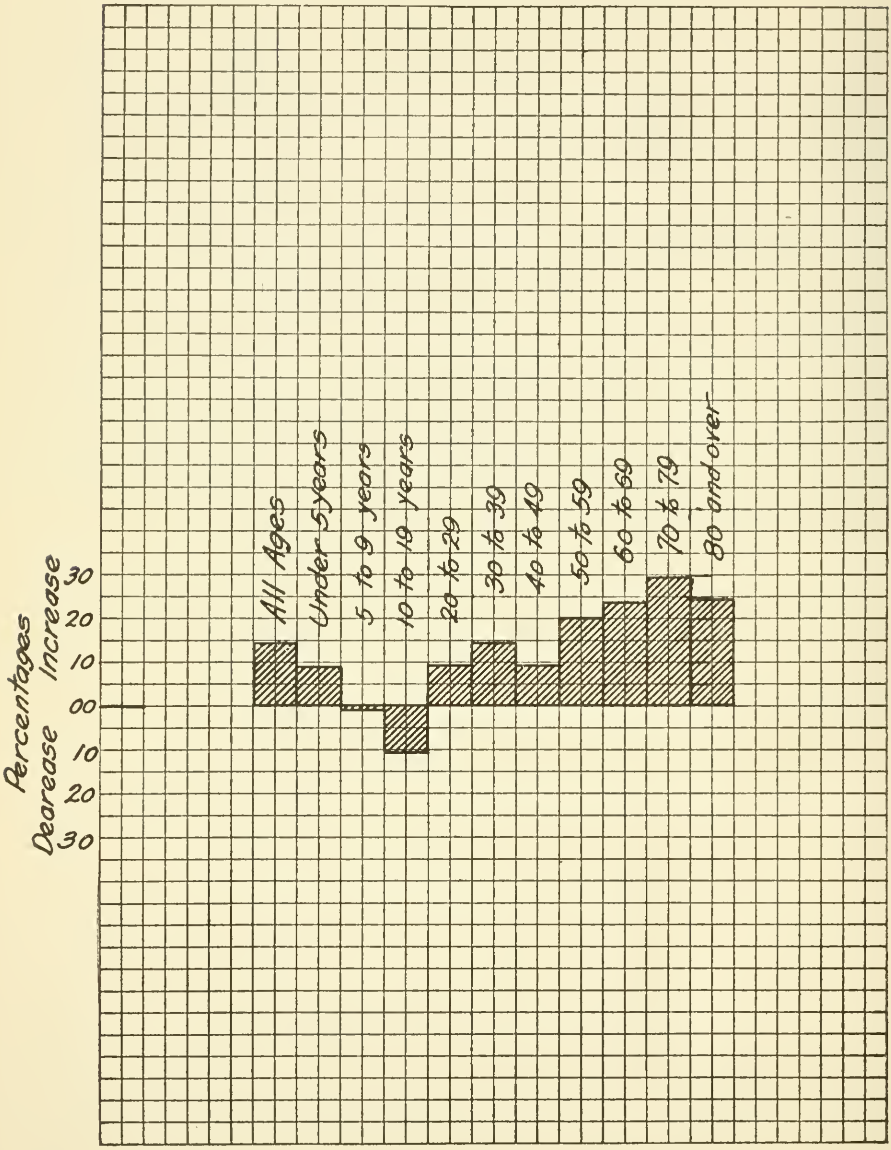
AGE DISTRIBUTION OF PNEUMONIA.

The age distribution of pneumonia is shown in Table 23. A study of the death rates at the various age groups indicates that in 1915, as compared with their average annual rates, broncho pneumonia shows an increase in the death rates at each age group, while from other forms of pneumonia a decrease is noted. At all ages, the death rate per 100,000 population from broncho pneumonia in 1915 was 33.6, while the average annual rate was 22.4. This is an increase of 33 per cent in the death rate of 1915 over the average for former years. The deaths from other forms of pneumonia in 1915 was equivalent to an annual rate of 69.3 per 100,000 population and the average annual rate for the former years was 77.1, representing a decrease in the rate for 1915 of 10 per cent.

While the death rate from broncho pneumonia for 1915 shows an increase over the rate for the former years at the various age groups, it will be noticed that the rates for those of under 1 year and over 80 years had a great influence on the increase of the rate, while in the "other forms of pneumonia" it will be noted that the greatest decreases in the rates of the various age groups occurred in under 1 year and at 80 years and over.

PNEUMONIA - ALL FORMS

PERCENTAGE INCREASE AND DECREASE IN DEATHS IN 1915 AS COMPARED TO 1914 - ARRANGED BY AGE GROUPS.



RESTRICTIVE AND PREVENTIVE MEASURES IN PNEUMONIA.

As there are a large number of non-fatal cases of pneumonia occurring in this State that are not reported by the attending physicians to the local health officers, it becomes impossible therefore for the restrictive and preventive measures to be carried out in all instances.

While this Board recommends that all persons sick with pneumonia must be isolated from all persons except the attendants, still it is believed that if the sputa and other discharges from the respiratory tract of the patients, together with the clothing and other articles contaminated by these discharges, are properly disinfected, little danger of the spread of the disease to others may be feared.

By Table 24 it will be seen that, in 1915, while the restrictive and preventive measures were enforced in a greater percentage of instances than for the average years, we still find that in 32 per cent of the cases these restrictive and preventive measures are not stated.

TABLE 24.—*Restrictive and preventive measures in pneumonia, in Michigan, in 1915, and the average for the years 1904–1914.*

Restrictive and preventive measures.	1915.		Average, 1904–1914.	
	Cases.	Per cent.	Cases.	Per cent.
Isolation.				
Enforced	2,414	60	1,590	46
Neglected	339	8	589	16
Not stated or statements doubtful	1,314	32	1,335	38
Disinfection of Sputa.				
Enforced	2,679	66	1,834	53
Neglected	69	2	240	7
Not stated or statements doubtful	1,315	32	1,369	40
Disinfection of Bedding, Clothing, etc., soiled by Sputa.				
Enforced	2,713	67	2,155	63
Neglected	42	1	217	6
Not stated or statements doubtful	1,301	32	1,071	31
Disinfection of Room.				
Enforced	2,667	66	2,155	61
Neglected	101	2	323	9
Not stated or statements doubtful	1,298	32	1,032	30

During the years 1904–1914, there were on the average 68 instances per year in which there was said to be no sputa, and in 1915, 10 instances; therefore these numbers have been deducted from the total number of cases occurring in each of the above years before making the per cent.

MENINGITIS IN MICHIGAN IN 1915 AND PRECEDING YEARS.

GENERAL PREVALENCE.

As indicated by the death rates per 100,000 population, meningitis is steadily decreasing in prevalence in this State. The rate for 1915 being the lowest of any year shown in Table 25.

The death rate from this disease in 1915 was 9.2, which, is slightly less than the rate for 1914. The rate for 1915 is 87 per cent less than the rate for the average of the years 1908-1912, which was 17.2.

This disease is essentially one of childhood, as over half the deaths occurring from this disease in Michigan during the years 1899-1915 were among children under five years of age.

The months in which this disease is most prevalent are March, April and May, and the least prevalent during the months of October, November and December.

TABLE 25.—*The prevalence of Meningitis, in Michigan, in each of the eighteen years, 1898–1915.*

Years.	Deaths.	Deaths per 100,000 population
1898	671	28.4
1899	1,051	44.0
1900	514	21.2
1901	427	17.4
1902	384	15.5
Average, 1898–1902	609	25.1
1903	382	15.3
1904	401	15.8
1905	460	18.0
1906	503	19.5
1907	569	21.8
Average, 1903–1907	463	18.1
1908	480	18.2
1909	468	17.6
1910	526	18.7
1911	487	17.0
1912	423	14.6
Average, 1908–1912	477	17.2
1913	358	12.1
1914	296	9.9
1915	276	9.2

WHOOPING COUGH IN MICHIGAN IN 1915 AND PRECEDING YEARS. GENERAL PREVALENCE.

During the year 1915 there were reported to this department 2,258 cases of whooping cough, of which number 234 or 10.4 per cent proved fatal. The death rate from this disease in 1915 was 20.6 per cent less than it was in 1914. There was also the same decrease in 1915 over that of the average of 1908-1912.

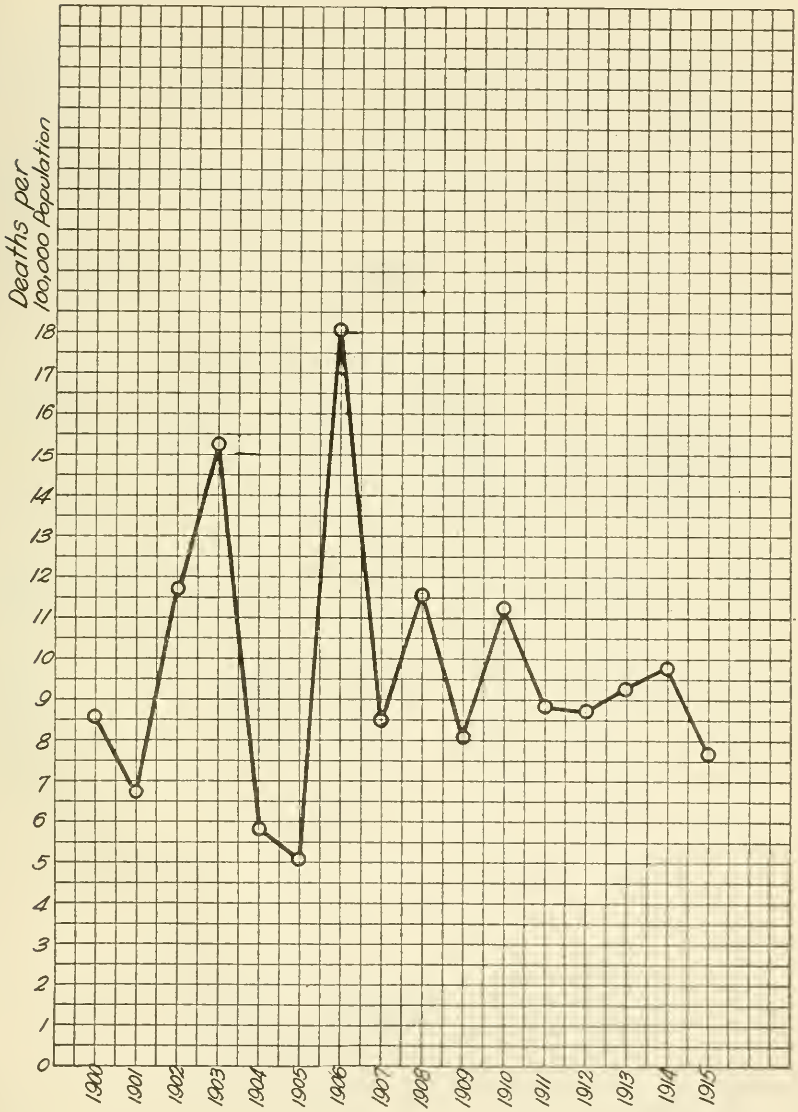
Comparison of the figures under the column captioned "deaths per 100 cases" shows this disease to be less fatal in 1915 than in any year since 1904, while our rate per 100,000 population shows 1915 to be less than any year since 1905; one explanation of this difference would be, not reporting the non-fatal cases. The figures in Table 26 for the years 1914 and 1915 would indicate that there were more non-fatal cases reported than in previous years.

TABLE 26.—*The prevalence of Whooping-cough in Michigan, in each of the thirty years, 1886 to 1915.*

Years.	*Cases.	Deaths.	Deaths per 100 cases.	Deaths per 100,000 population.
1886	2,642	62	2.3	3.2
1887	2,267	59	2.6	2.0
1888	2,502	49	2.0	2.4
1889	2,694	41	1.5	2.0
1890	983	20	2.0	1.0
1891	2,360	101	4.3	4.7
1892	3,188	77	2.4	3.6
1893	4,047	134	3.3	6.1
1894	4,555	123	2.7	5.5
1895	4,284	109	2.5	4.8
1896	5,466	91	1.7	4.0
1897	3,978	72	1.8	3.1
Average, 1886 to 1897	3,247	78	2.4	3.6
1898	5,300	282	5.3	12.0
1899	6,509	238	3.7	10.0
1900	3,397	208	6.1	8.6
1901	2,955	163	5.5	6.7
1902	3,534	289	8.2	11.7
Average, 1898 to 1902	4,339	236	5.4	9.8
1903	4,172	383	9.2	15.3
1904	1,779	148	8.3	5.8
1905	1,196	131	11.0	5.1
1906	1,364	469	34.4	18.1
1907	872	223	25.6	8.5
Average, 1903 to 1907	1,877	271	14.4	10.6
1908	1,248	305	24.4	11.6
1909	1,054	217	20.6	8.1
1910	1,136	318	28.0	11.3
1911	1,897	254	13.4	8.9
1912	1,255	252	20.0	8.7
Average, 1908 to 1912	1,318	269	20.4	9.7
1913	929	276	29.7	9.3
1914	1,822	290	15.9	9.7
1915	2,258	234	10.4	7.7

*From many localities only the fatal cases were reported, so that the figures in this column do not represent the number of cases that actually occurred.

DIAGRAM SHOWING THE PREVALENCE OF WHOOPING-COUGH IN MICHIGAN, DURING THE YEARS 1900-1915 INCLUSIVE.



AGE DISTRIBUTION OF WHOOPING COUGH.

Whooping cough, as indicated by the death rates shown in Table 27, demands its greatest toll from among children of under one year of age. The death rates of all the different age groups in 1915 show a slight decrease over that of the average annual rates.

TABLE 27.—*The age distribution of fatal cases of Whooping-cough in Michigan, as indicated by the number of deaths and the death rates per 100,000 population from this disease, at each age group in 1915, and the average number of deaths and death rates at each age group during the years 1900 to 1914, inclusive.*

	1915.		Average, 1900 to 1914.	
	The total number of deaths during the year 1915.	Death rates per 100,000 population of same age.	Average annual number of deaths during the years 1900–1914.	Death rates per 100,000 population of same age.
All ages	234	7.7	255	9.6
Under 1 year	149	256.4	162	271.4
1 to 4 years	81	31.5	83	36.5
5 to 9 years	4	1.4	8	2.9
10 to 19 years	....	....	2	0.3
20 years and over	....	....	1	0.06

THE SEASONAL PREVALENCE OF WHOOPING COUGH.

As will be seen by reference to Table 28, whooping cough, on the average, reaches its maximum prevalency during the months of from March to May, inclusive, and the minimum prevalency during September to December. In 1915 this disease was most prevalent during the months of from January to June inclusive, and during these months the maximum of prevalency occurred during the month of May, while the minimum prevalency was during the month of December.

TABLE 28.—*The seasonal prevalence of whooping-cough in Michigan, as indicated by the number of deaths from this disease in each month in 1915, and the average number of deaths in each month during the years 1900 to 1914, inclusive.*

	1915.		Average, 1900 to 1914.	
	The number of deaths occurring in each month during the year 1915.	Monthly deaths reduced to a standard of 100.	Average number of deaths occurring in each month during the years 1900–1914.	Monthly deaths reduced to a standard of 100.
January	30	115.4	19	87.7
February	30	126.9	21	106.0
March	34	131.8	28	129.2
April	26	103.8	26	124.6
May	37	143.4	28	129.2
June	34	135.6	21	101.5
July	20	76.9	24	110.8
August	31	119.2	24	110.8
September	16	65.4	19	92.3
October	16	61.5	15	69.2
November	19	76.9	15	69.2
December	11	42.3	15	69.2
Total	304	100.0	255	100.0

SCARLET FEVER IN MICHIGAN IN 1915 AND PRECEDING YEARS. GENERAL PREVALENCE.

During the year 1915 there were reported to this department 3,402 cases of scarlet fever, of which number 110 or 3.2 per cent proved fatal. This number of deaths corresponds to an annual death rate of 3.6 per 100,000 population, which is the lowest death rate ever recorded in this state since 1884, and the reported cases were less in 1915 than that of any year since 1908.

TABLE 29.—*The prevalence of scarlet fever in Michigan, in each of the thirty-two years, 1884 to 1915.*

Years.	*Cases.	Deaths.	Deaths per 100 cases.	Deaths per 100,000 population.
1884	2,476	230	9.3	12.4
1885	2,750	187	6.8	9.9
1886	3,046	275	9.0	14.2
1887	3,400	314	9.2	15.9
1888	2,989	200	6.7	9.9
1889	3,535	166	4.7	8.1
1890	3,835	162	4.2	7.7
1891	6,212	286	4.6	13.4
1892	7,075	487	6.9	22.5
1893	6,065	415	6.8	18.5
1894	5,500	203	3.7	9.1
1895	3,908	125	3.2	5.5
1896	2,646	81	3.1	3.9
1897	2,482	115	4.6	4.9
Average, 1884 to 1897	3,994	232	5.8	11.0
1898	2,409	91	3.8	3.9
1899	4,345	144	3.3	6.0
1900	6,734	272	4.0	11.2
1901	7,726	312	4.0	12.7
1902	6,582	277	4.2	11.2
Average, 1898 to 1902	5,559	219	3.9	9.1
1903	5,353	200	3.7	8.0
1904	4,088	210	5.1	8.3
1905	2,286	123	5.4	4.8
1906	3,066	227	7.4	8.8
1907	2,514	159	6.3	6.1
Average, 1903 to 1907	3,461	184	5.3	7.2
1908	3,087	194	6.3	7.4
1909	5,153	275	5.3	10.3
1910	6,501	297	4.6	10.6
1911	5,177	208	4.0	7.3
1912	4,533	186	4.1	6.4
Average, 1908 to 1912	4,890	232	4.7	8.4
1913	4,140	281	6.8	9.5
1914	3,769	179	4.7	6.0
1915	3,402	110	3.2	3.6

*From many localities only the fatal cases were reported, so that the figures in this column do not represent the number of cases that actually occurred.

THE PREVALENCE OF SCARLET FEVER IN URBAN AND RURAL LOCALITIES.

Table 30 shows the death rates per 100,000 population in the urban and rural localities of Michigan.

This disease, as indicated by the death rates, is considerably more prevalent in the urban than rural localities, although the rates for 1915 are practically the same.

While the death rates in both localities fluctuate from year to year, still the prevalence of this disease seems to be decreasing in both localities.

TABLE 30.—*The death rates per 100,000 population from scarlet fever in the urban and rural localities in Michigan, during each of the years 1900 to 1915.*

Years.	Death rates per 100,000 population in	
	Urban.	Rural.
1900	9.8	11.7
1901	14.3	11.7
1902	14.5	9.1
1903	7.1	8.4
1904	7.8	8.5
1905	4.9	4.4
1906	14.5	5.9
1907	11.0	3.8
1908	11.8	4.5
1909	16.4	6.7
1910	13.8	8.9
1911	9.2	5.9
1912	7.5	5.6
1913	14.0	6.7
1914	8.2	4.6
1915	3.4	3.8

NOTE.—The term "Urban" as here used is restricted to municipalities having 10,000 or more inhabitants in 1910; smaller places being included with the "Rural" districts.

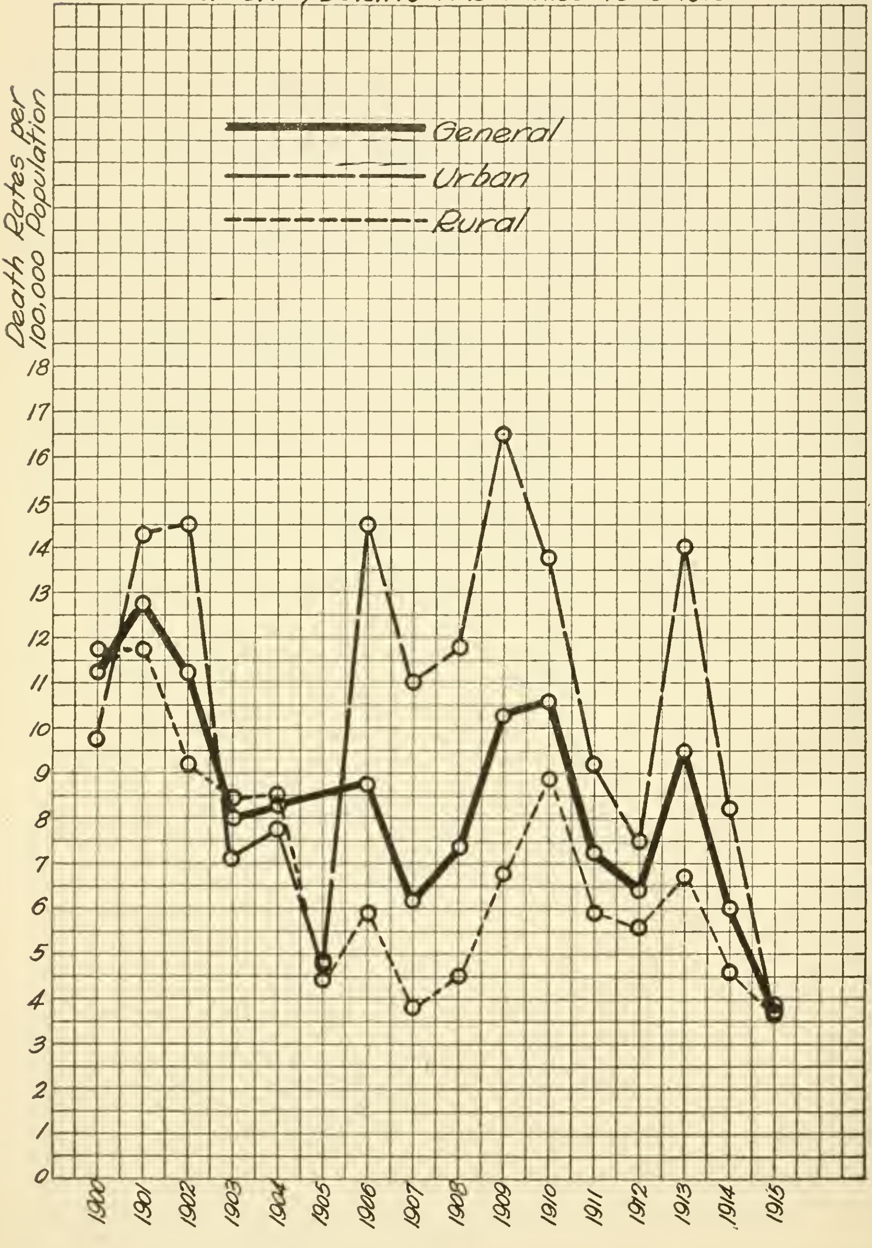


DIAGRAM SHOWING THE FATALITY OF SCARLET FEVER IN MICHIGAN, DURING THE YEARS 1900-1915

SCARLET FEVER IN CITIES OF MICHIGAN OF 10,000 INHABITANTS AND OVER.

As indicated by the death rates as shown in Table 31, scarlet fever seems to be most prevalent in the larger cities of Michigan. The death rates for each group of cities for 1915, show a decided decrease compared with the average annual rate for the years 1904 to 1915.

The cities having unusually high death rates in 1915 compared with the rate for the entire state for that year (3.6) were: Muskegon, (11.6), Pontiac (11.7), Lansing (10.3), Ishpeming (8.3), Alpena (7.6), Ann Arbor (6.7), and Detroit (4.6).

TABLE 31.—*The cases, deaths and death rates per 100,000 population from scarlet fever in 1915, also the averages of the same for the years 1904 to 1914, inclusive, in cities of Michigan of 10,000 inhabitants and over.*

	1915.			Average, 1904 to 1914.		
	Cases.	Deaths.	Deaths per 100,000 inhabitants.	Cases.	Deaths.	Deaths per 100,000 inhabitants.
Cities over 50,000 inhabitants	**1,101**	**28**	**3.8**	......	**85**	**13.9**
Detroit	906	26	4.6	927	71	15.7
Grand Rapids	94	1	0.8	355	13	11.8
Saginaw	101	1	1.8	79	2	4.0
Cities from 25,000 to 50,000 inhabitants	**560**	**8**	**2.9**	......	**10.9**	**4.3**
Battle Creek	52	......	......	50	.5	2.0
Bay City	43	......	......	113	5	11.2
Flint	25	......	......	45	1	2.7
Jackson	78	1	2.9	30	1	3.2
Kalamazoo	15	......	......	70	2	5.2
Lansing	127	4	10.3	21	.6	2.0
Muskegon	220	3	11.6	54	.8	3.4
Cities from 10,000 to 25,000 inhabitants	**153**	**5**	**2.8**	......	**10.2**	**6.1**
Adrian	......	......	......	3	5	4.7
Alpena	7	1	7.6	12	4	3.2
Ann Arbor	45	1	6.7	21	.4	2.7
Escanaba	2	......	......	14	8	6.2
Ironwood	16	......	......	14	3	23.9
Ishpeming	15	1	8.3	29	1	8.0
Manistee	1	......	......	32	1	8.0
Marquette	2	......	......	16	1	8.8
Menominee	10	......	......	11	.5	4.7
Pontiac	40	2	11.7	15	5	3.5
Port Huron	13	......	......	23	.4	2.1
Sault Ste. Marie	1	......	......	8	.3	2.4
Traverse City	1	......	......	21	4	3.4

THE SEASONAL PREVALENCE OF SCARLET FEVER.

As indicated by figures shown in Table 32, scarlet fever on the average, is most prevalent during the months of November to May inclusive, and of these months the maximum occurs in March. The month in which the prevalence reaches the minimum is September. Comparing 1915 with the average of 1898 to 1914, we find that this disease reaches the maximum in March, in both cases, while the minimum in 1915 is in August, September and November. The deaths in 1915 show a considerable decrease over that of the average, this is most noticeable in the months from April to December inclusive.

TABLE 32.—*The seasonal prevalence of scarlet fever in Michigan, as indicated by the number of deaths from this disease in each month in 1915 and the average number of deaths in each month during the years 1898 to 1914.*

Month.	1915.		Average, 1898 to 1914.	
	The number of deaths occurring in each month during the year 1915.	Monthly deaths reduced to a standard of 100.	Average number of deaths occurring in each month during the year 1898 to 1914.	Monthly deaths reduced to a standard of 100.
January	19	204.3	26	144.4
February	18	215.1	23	138.9
March	21	225.8	27	150.0
April	12	129.0	22	127.8
May	8	85.1	21	116.7
June	5	53.8	13	72.2
July	3	32.2	10	55.6
August	4	43.0	10	55.6
September	4	43.0	9	50.0
October	5	53.8	14	77.8
November	4	43.0	19	105.6
December	7	75.3	22	122.2
Total	110	100.0	216	100.0

AGE DISTRIBUTION OF SCARLET FEVER.

By reference to Table 33, it may be seen that scarlet fever is a disease confined mostly to children under ten years of age, although deaths are recorded at each age group throughout the entire lifetime.

It will be noticed that the death rate in 1915 was considerably less than the average rate at all ages. The decline in the 1915 rate was due to the decline in the rate of those children under nine years of age, and especially those under five years of age, while the rates for those between twenty and forty years of age remain practically the same. For the years forty and over the rate for 1915 shows an increase over that of the average annual death rate.

TABLE 33.—*The age distribution of fatal cases of scarlet fever in Michigan, as indicated by the number of deaths and death rates per 100,000 population from this disease at each age group in 1915, and the average number of deaths and death rates at each age group during the years 1898 to 1914.*

	1915.		Average, 1898 to 1914.	
	The total number of deaths during the year 1915.	Death rates per 100,000 population of same age.	Average annual number of deaths during the year 1898 to 1914.	Death rates per 100,000 population of same age.
ALL AGES	110	3.6	214	8.3
Under 1 year	6	9.1	15	25.5
Under 5 years	39	12.3	118	42.9
5 to 9 years	34	12.1	61	22.5
10 to 19 years	19	3.5	24	4.6
20 to 29 years	8	1.5	7	1.6
30 to 39 years	3	0.7	3	0.7
40 to 49 years	3	0.9	.9	0.3
50 to 59 years	2	0.8	.3	0.1
60 to 69 years	2	1.2	.1	0.9
70 to 79 years	....	....	....	....
80 years and over	....	....	.1	0.7
Unknown	....	....	.2	....

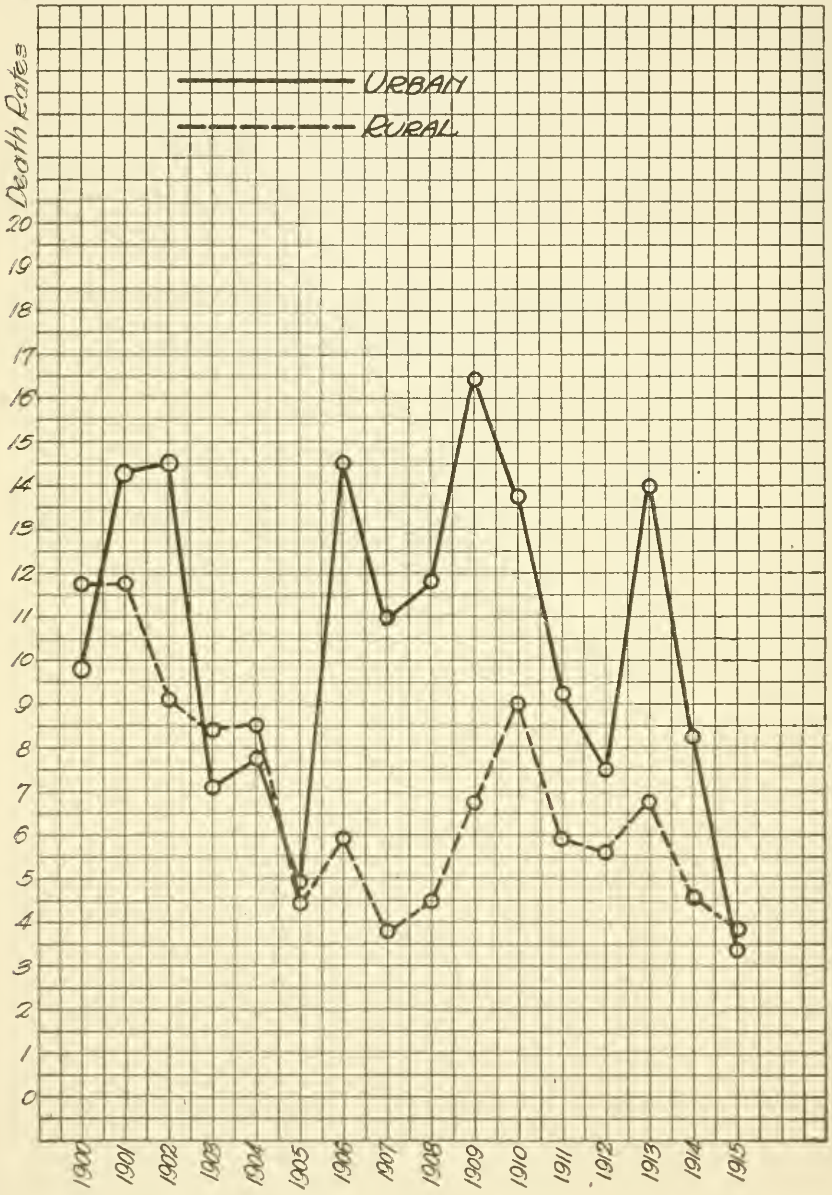


DIAGRAM SHOWING DEATH RATES FROM SCARLET FEVER PER 100,000 POPULATION, IN MICHIGAN, URBAN AND RURAL, 1900-1915

MEASLES IN MICHIGAN IN 1915 AND PRECEDING YEARS

GENERAL PREVALENCE.

During the year 1915, there were reported to this department 4,438 cases, including 104 deaths from measles. While the cases for 1915 are very much under the averages, the year 1912, in which there were 2,834 cases reported, is the only year since 1895 that had fewer cases reported to this department.

The number of fatal cases of measles corresponds to the annual death rate of 3.4 per 100,000 population, and which rate is 42 per cent less than the rate for the preceding year.

TABLE 34.—*The prevalence of measles in Michigan, during each of the twenty-six years, 1890–1915.*

Years.	*Cases.	Deaths.	Deaths per 100 cases.	Deaths per 100,000 population.
1890	11,911	140	1.2	6.7
1891	12,173	149	1.2	7.0
1892	3,830	76	2.0	3.5
1893	7,334	119	1.6	5.4
1894	10,518	55	.5	2.5
1895	3,870	12	.3	.5
1896	15,409	156	1.0	6.8
1897	32,543	159	.5	6.8
Average, 1890–1897	12,199	108	.9	4.9
1898	11,614	131	1.1	5.6
1899	12,005	187	1.6	7.8
1900	20,403	342	1.7	14.1
1901	4,629	79	1.7	3.2
1902	11,978	238	2.0	9.6
Average, 1898–1902	12,126	195	1.6	8.1
1903	8,941	176	2.0	7.0
1904	10,386	194	1.9	7.7
1905	6,061	123	2.0	4.8
1906	7,403	251	3.4	9.7
1907	12,139	256	2.1	9.8
Average, 1903–1907	8,936	200	2.2	7.8
1908	4,775	121	2.5	4.6
1909	9,047	270	3.0	10.1
1910	13,934	251	1.8	8.9
1911	9,639	200	2.1	7.0
1912	2,834	118	4.2	4.1
Average, 1908–1912	8,046	192	2.4	6.9
1913	9,185	253	2.8	8.6
1914	11,356	177	1.6	5.9
1915	4,438	104	2.3	3.4

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*From many localities only the fatal cases were reported, so that the figures in this column do not represent the number of cases that actually occurred.

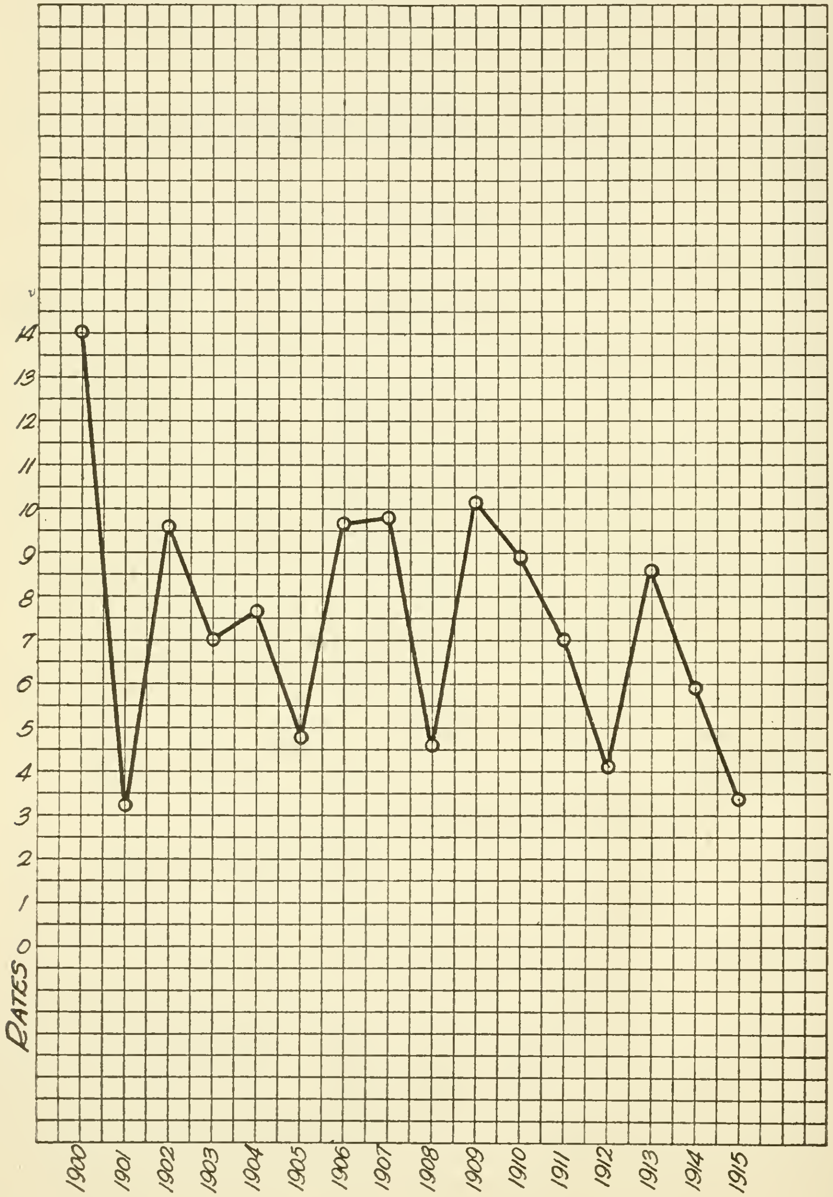

DIAGRAM SHOWING FATALITY OF MEASLES, IN MICHIGAN PER 100,000 POPULATION, DURING YEARS 1900-1915

MEASLES IN CITIES OF 10,000 INHABITANTS AND OVER.

In Table 35 may be seen the prevalence of measles in cities of Michigan having 10,000 or more inhabitants during the year 1915, and the average annual rates for the years 1904-1914.

The cities having unusually high death rates from this disease in 1915 as compared with the rate for the State for that year (3.4) were: Detroit (8.9), and Port Huron (5.3).

TABLE 35.—*The deaths and death rates per 100,000 population from measles, in 1915, also the averages for the years 1904–1914, in cities in Michigan of 10,000 inhabitants and over.*

	1915.		Average, 1904–1914.	
	Deaths.	Deaths per 100,000 inhabitants.	Deaths.	Deaths per 100,000 inhabitants.
Cities over 50,000 inhabitants	50	6.8	54	8.8
Detroit	50	8.9	46	10.2
Grand Rapids	......	......	6	5.4
Saginaw	......	......	2	4.0
Cities of 25,000 to 50,000 inhabitants	4	1.8	15.5	6.8
Battle Creek	1	3.5	3	12.1
Bay City	1	2.1	6	13.4
Flint	1	1.9	2	5.5
Jackson	1	2.9	1	3.2
Kalamazoo	......	......	2	5.2
Lansing	......	......	1	3.0
Muskegon	......	......	.5	2.1
Cities of 10,000 to 25,000 inhabitants	1	0.6	8.4	5.0
Adrian	......	......	.3	2.8
Alpena	......	......	1	8.0
Ann Arbor	......	......	.3	2.0
Escanaba	......	......	1	7.7
Ironwood	......	......	1	8.0
Ishpeming	......	......	2	16.0
Manistee	......	......	.4	3.2
Marquette	......	......	.6	5.3
Menominee	......	......	.5	4.7
Pontiac	......	......	1	7.1
Port Huron	1	5.3	1	5.3
Sault Ste. Marie	......	......	.6	4.8
Traverse City	......	......	.7	5.9

SEASONAL PREVALENCE OF MEASLES.

The months in which measles is most prevalent is shown in Table 36. On the average measles is most prevalent during the months from March to June, while in 1915 the disease was most prevalent from April to June, inclusive, or one month later than on the average. The month in which the prevalence reached the minimum in 1915 was October, while on the average the minimum was in September.

TABLE 36.—*The seasonal prevalence of measles in Michigan, as indicated by the number of deaths from this disease in each month in 1915, and the average number of deaths in each month during the years 1898–1914.*

Month	1915.		Average, 1898–1914.	
	The number of deaths occurring in each month during the year 1915.	Monthly deaths reduced to a standard of 100.	Average number of deaths occurring in each month during the years 1898–1914.	Monthly deaths reduced to a standard of 100.
January	6	68.2	31	98.2
February	7	90.9	18	117.6
March	8	90.9	28	164.7
April	18	215.9	31	188.2
May	12	136.4	34	200.0
June	19	227.3	23	141.2
July	4	45.5	15	88.2
August	7	79.5	7	41.2
September	4	45.5	3	17.6
October	1	11.4	4.7	27.6
November	2	22.7	7.7	45.3
December	16	181.8	11.9	70.0
Total	104	100.0	200	100.0

AGE DISTRIBUTION OF MEASLES.

As indicated by the death rates per 100,000 population at each age group, measles is the most prevalent among children under five years of age. Of the children under five years, those under one year of age are the most susceptible to this disease, their death rate being 20 per cent higher than those whose ages range from one to four years, inclusive. Beginning with the fifth year of age, the death rate decreases very rapidly, and with the increase of age a decrease of prevalence is noted.

TABLE 37.—*The age distribution of fatal cases of measles in Michigan, as indicated by the number of deaths and death rates per 100,000 population from this disease at each age group in 1915, and the average number of deaths and death rates at each age group during the years 1898–1914, inclusive.*

Age groups.	1915		Average, 1898–1914.	
	The total number of deaths during the year 1915.	Death rates per 100,000 population of same age.	Average annual number of deaths during the years 1898–1914.	Death rates per 100,000 population of same age.
ALL AGES	104	3.4	198	7.6
Under 1 year	22	33.3	51	84.4
Under 5 years	88	27.7	147	52.6
5 to 9 years	9	3.2	20	7.5
10 to 19 years	4	.7	14	2.7
20 to 29 years	1	.2	7	1.6
30 to 39 years	.....	.....	5	1.4
40 to 49 years	1	.3	3	1.1
50 to 59 years	1	.4	1	0.6
60 to 69 years	.....	.....	.4	0.3
70 to 79 years	.....	.....	7	0.9
80 years and over	.....	.....	2	1.0
Unknown	.....	.....	.2	.....

SMALLPOX IN MICHIGAN IN 1915 AND PRECEDING YEARS.

GENERAL PREVALENCE.

The prevalence of smallpox in Michigan for 1915 and preceding years is shown in Table 38.

While this disease was more prevalent in 1915 than it was in 1914 and

1913, it is still considerably below the average for the years of 1908-1912 inclusive.

TABLE 38.—*The prevalence of small-pox in Michigan, during the thirty-four years, 1882–1915.*

Years.	Cases.	Deaths.	Deaths per 100 cases.	Deaths per 100,000 population.
1882	589	159	27.0	9.1
1883	29	2	6.9	.1
1884	22	3	13.6	.2
1885	27	6	22.2	.3
1886	24	7	29.2	.4
1887	4	0	....	....
1888	42	6	14.3	.3
1889	57	4	7.0	.2
1890	2	0	....	....
1891	3	0	....	....
1892	1	1	100.0	.05
1893	10	3	30.0	.1
1894	285	60	21.1	2.7
1895	187	47	25.1	2.1
1896	38	16	42.1	.7
1897	15	0	....	....
Average, 1882–1897	83	19	23.5	1.0
1898	32	1	3.1	.04
1899	139	6	4.3	.3
1900	694	9	1.3	.4
1901	5,088	31	.6	1.3
1902	7,086	40	.6	1.6
Average, 1898–1902	2,608	17	.7	.7
1903	6,341	33	.5	1.3
1904	5,753	24	.4	.9
1905	2,985	74	2.5	2.9
1906	1,240	3	.2	.1
1907	1,712	8	.5	.3
Average, 1903–1907	3,606	28	.8	1.1
1908	2,306	8	.3	.3
1909	1,533	4	.3	.2
1910	3,319	120	3.6	4.3
1911	898	9	1.0	.3
1912	1,127	3	.3	.1
Average, 1908–1912	1,837	29	1.6	1.0
1913	1,995	4	.2	.1
1914	1,527	1	.07	.03
1915	1,094	5	.5	.2

ACUTE ANTERIOR POLIOMYELITIS (INFANTILE PARALYSIS) IN MICHIGAN IN 1915 AND PRECEDING YEARS.

The following table shows the general prevalence of the disease during the six years, 1910-1915.

Years.	Cases.	Deaths.	Deaths per 100,000 population.
1910	104	72	2.6
1911	68	35	1.2
1912	78	33	1.1
1913	56	29	1.0
1914	49	28	0.9
1915	95	34	1.1

CHICKEN-POX (VARICELLA) IN MICHIGAN IN 1915.

During the year 1915 there were reported to this department 1,104 cases, of which 4 proved fatal.

ERYSIPELAS IN MICHIGAN IN 1915.

During the year 1915 reports were received relative to 210 cases of erysipelas in this State, 110 of which proved fatal.

TETANUS (LOCK-JAW) IN MICHIGAN IN 1915.

During the year 1915, there were reported to this board 27 cases of tetanus all of which proved fatal.

MUMPS (PAROTITIS) IN MICHIGAN IN 1915.

During the year 1915 there were reported to this department 115 cases of mumps, of which number 4 proved fatal.

SYPHILIS IN MICHIGAN IN 1915.

Syphilis was reported from six localities of the state with a total of 23 cases.

GONORRHOEA IN MICHIGAN IN 1915.

Gonorrhoea was reported from twelve localities of the State with a total of 35 cases.

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